THE ENGINEERING AND MINING JOURNAL.

RICHARD P. ROTHWELL, C. E., M. E.
ROSSITER W. RAYMOND, Ph. D. } Editors.

NOTE.—Communications relative to the editorial management should be addressed to Mr. ROTHWELL. The articles written by Mr. Raymond will be signed with a star.

CONTENTS.

EDITORIALS:
American Institute of Mining Engineers.... 261
International Blackguardism..... 261
Floating Mining Stocks in New York... 261
A Visit to American Fork, Utah 262
Deflection of Girders (Illustrated)..... 263
A New Use of Copper, and its Metallurgy. 263
Description of a Double Muffle Furnace, (Illustrated).... 264
Project for the Erection of Blast Furnaces in New Jersey..... 266
Novel Hint 267
Abstracts of Lectures on Mining.—No. XIV..... 267
The Hunt & Douglas Copper Process Abroad..... 268
Blowing and Ventilating Machines at the Philadelphia Exhibition..... 268
Admissions to International Exhibition... 269
Mining Notes from California, Colorado, Nevada, and Utah..... 269
Mine Inspector Appointed..... 269
Cambria Iron Company..... 269
Exodus of Miners from the Anthracite Regions..... 269
Phœnix Iron Company Mill..... 269
Coking Anthracite Culm..... 269
STATISTICS OF COAL PRODUCTION..... 270
COAL TRADE REVIEW 270
IRON MARKET REVIEW..... 271
METALS..... 272
FINANCIAL:
New York Stocks..... 272
Philadelphia Stocks..... 273
Gold and Silver Stocks..... 274
Copper Stocks..... 274
Gas Stocks..... 275
Advertisements..... 275

AMERICAN INSTITUTE OF MINING ENGINEERS.

OFFICIAL BULLETIN.

THE October Meeting of the Institute will be held in Philadelphia, beginning Tuesday evening, October 24th, in the hall of the Franklin Institute, Seventh Street, below Market. The Council has decided to have no excursions during this meeting, that the members in attendance may have the opportunity to visit the International Exhibition. Members are earnestly requested to give early notice to the Secretary of the titles of papers to be read. Blank proposals for membership of the Institute can be obtained from the Secretary.

Authors of papers read before the Institute are entitled to twelve copies of the ENGINEERING AND MINING JOURNAL containing their papers. These copies will be sent on application to the Office of the JOURNAL, or the Secretary of the Institute, immediately after the appearance of the papers. Back numbers cannot always be supplied.

EASTON, Pa., Oct. 2, 1876. THOMAS M. DROWN, Secretary.

INTERNATIONAL BLACKGUARDISM.

The Bulletin of the American Iron and Steel Association, unable to defend the vulgarities and absurdities of Mr. SWANK's now notorious report, resorts to reiteration and abuse. One of the evil results which we deprecated on the first appearance of the report is now coming to pass. That ridiculous and disgraceful document has been accepted, to a considerable extent, on the other side of the water as the authoritative utterance of American Protectionists, and has received, as such, an amount of attention to which no circumstance of its origin and no particular of its contents would entitle it. Even Mr. I. LOWTHIAN BELL, who must be personally aware that the majority of intelligent protectionists utterly repudiate the vulgar abuse and the insane exaggeration of such documents as Mr. SWANK has issued, has felt himself called upon to mention the report, and to promise a still further review of it. We caution Mr. BELL and British Free Traders generally, that they should not delude themselves with the fancy that to expose the weakness and reprove the scurrility of such a publication is to answer the real argument for reasonable and judicious protection of domestic industry. They may treat Mr. SWANK's tone with indignant contempt, as Americans regard it with indignant mortification; they may cover his assertions with well-deserved ridicule, and disprove his propositions as conclusively as his propositions disprove each other; but after all this has been done, and SWANK has been utterly swept away, nothing has been accomplished toward settling the main question. Falling upon a ragged camp-follower, and ducking him in a horse-pond, is not winning a battle. Hence, knowing very well that Mr. BELL, or a much less accomplished champion, would have an easy victory over this crazy straggler, we protest in advance against their overestimate of such a trivial triumph. Mr. BELL might, possibly, at some time think it necessary to reply in Parliament to the impudent nonsense of Sergeant KENEALY; but he would not fancy that, in doing so, he had really settled the relations of Church and State.

The style of political discussion in which the *Bulletin* is now engaged possesses this attraction for a disputant in extremity; that, whatever may be his embarrassment in argument, he can always fill a column with quotations from English police-reports and figures illustrative of the awful condition of that diseased monarchy. When a British journal, in reply, adduces the death of a dozen persons by starvation in New York the *Bulletin* has only to say that New York never was a fair specimen of the results of protection, and, moreover, that everybody who dies of starvation here is *of foreign birth*. This insidious malarial effect of Free Trade upon the infant in the cradle, planting the seeds of starvation so deeply that the (imperfect) protective atmosphere of New York cannot hinder their blossoming, is a startling discovery, and will reflect as much credit upon the *Bulletin* as it will shed terror upon the soul of the intending immigrant. Let no one whose digestive apparatus has been weakened by Free Trade dream of bettering his condition by coming to this country. Starvation stalks abroad like a census-taker, and after due inquiry concerning the nativity of its victim, gobbles him up as an awful warning.

Then there are the children that work in mines, and brick-yards, and factories in great Britain—wholly by reason of Free Trade. It is true that the other day a witness in the Mollie Maguire trials at Pottsville testified that he could not read or write, because he had worked in the mines and breakers since he could go alone, and had never been sent to school. Some illogical Britisher might say, moreover, that in England the law protects children more thoroughly, and provides more effectually for their education, than do the laws of most of our States. But that is quite impertinent. The truth evidently is, that these boys who work so hard from babyhood in a land of high wages are simply acting out an inherited tendency, planted in their unfortunate bones by many years of Free Trade, under which their parents or grandparents undoubtedly suffered.

What a light this novel line of argument throws upon the vexed question of the origin of evil! Tyranny, dog-fights, starvation (of foreigners), contraction of currency, specie-payments, immorality, infidelity, increased consumption of spirits—in a word, all the evils that afflict mankind—are easily traced to Free Trade. Free Trade (that is, the disregard of *duty*) by Adam and Eve

"Brought sin into the world, and all our woe."

A most satisfactory theory, and, to those who can appreciate it, doubtless far superior to the Darwinian or the orthodox. Unfortunately, we do not yet rise to that sublime height from which Mr. SWANK sees all things in heaven and earth revolve about the immortal pivot of his last annual report. We are haunted with the suspicion that international blackguardism is not argument; that many of the sufferings of the poor in England, as in New York, are the accompaniment of dense population; that England's noblest minds are laboring with the great problem of relief and elevation for these classes; that the taunts and accusations flung out by Mr. SWANK against the capitalists of Great Britain are infamous libels; and that the policy of judicious and discriminating protection to American industry must be advocated on better grounds than these, and with some respect for manners and truth, if it is to be saved from disastrous overthrow. The *Bulletin* constantly entreats its cotemporaries to reprint its articles in favor of Protection, and appears to wonder that, as it naïvely says, they are "so slow to help to hold the fort." The reason of this slowness is plain enough. People who really mean to "hold the fort" will not spend their time carting in dirt and rubbish, just because the *Bulletin* has labeled it "Ammunition." If the *American Iron and Steel Association* wishes to have its documents circulated, let it take more pains to make them worthy of circulation. As for most of the trash now offered by it, it not only will not help hold the fort, but the fort cannot safely or comfortably hold it. *

FLOATING MINING STOCKS IN NEW YORK.

THE American Mining Stock Board may be made a most useful and creditable institution, or it may become a positive injury to legitimate mining enterprise, according to the manner in which the facilities it offers are allowed to be properly used or improperly abused. The high reputation and good standing of the gentlemen connected with the new board are guarantees that nothing dishonorable will, knowingly, be allowed in the transactions carried on under their auspices; and, indeed, it is so clearly the interest of every one who desires to see mining investments attracting their deserved degree of attention in this financial center, to protect investors from unprofitable, not to say worthless stocks, that we feel we but echo the sentiments of all when we point out more clearly some abuses which we have already hinted at, in our financial articles, during the past two weeks.

It seems scarcely necessary, with intelligent men, to insist upon the fact that an undeveloped "claim" or "location" on a mineral vein, even if it be a Comstock vein, by no means constitutes a mine, or the basis for a valuation of millions, or even of hundreds of thousands of dollars. With this preliminary remark, we proceed to the immediate subject of our article.

The Grant Mining Company's stock has been the most active on the list since the new board first commenced calling stocks.

The first week, commencing 2d October, gave sales of 7,000 shares of Grant out of a total of about 20,000 shares of all kinds sold. In the second week there were 11,300 shares of Grant sold out of a total of 31,000 shares of all kinds, and for the week just closed the number of shares of this stock sold was 12,450 out of a total of 53,000 shares. The prices obtained were made to increase from $3 per share at the first call to $7 per share during the past week. Such an extraordinary activity in a stock that had never before been heard of, naturally attracted our attention, and the information we have received concerning the company seems to indicate the following as the facts in the case:

The Grant Company owns a "claim" or "location" of 1,000 feet on a vein situated in Lyon County, Nev. The vein is supposed to be a branch of the Comstock, and the exploration of it consists of a single shaft of 120 to 150 feet in depth. No such exploration of the vein has been made as would prove its continuity or the richness of the ore, in fact there is scarcely a mine, hoisting or pumping works, or improvements of any kind, and no stamp mill. Assays of samples of ore running from $49 to $2,745 a ton are given, but no statement is made of the amount of such ore in sight, nor is any definite information given which proves the property to be worth anything whatever. So far there is nothing mischievous about the matter, it is simply an undeveloped property which has been put in a company with a totally unwarrantable capital, and no one understanding the facts would, of course, give much for stock based upon so slender a foundation. Having found it impossible to raise working capital on the Pacific Coast, where such enterprises are better under-

stood than here, the company has come to New York to seek for money. Before the opening of the new Stock Board the representatives of the company offered the stock at $2.50 a share. On the opening of the Board it was quoted at $3, and has since sold, as above stated, at prices ranging from $3 to $7 per share, which would make the price of the undeveloped claim from $300,000 to $700,000. An inquiry into the nature of the sales seems to show that they are what brokers call "washed," that is, the company sells and buys its own securities through agents. In other words, it seems to be simply a *mock auction*, in which an interest is sought to be created among investors by a fictitious activity in the stock, with the hope of catching some unwary capitalist, or floating some of the stock, in order to have some one on whom to make assessments. The whole proceeding, as it appears on the surface, is entirely disreputable, and if such transactions are to be carried on under the auspices, and with the approval of the new Board, it requires no prophet to foretell its speedy dissolution, for it would simply be a curse, and not a benefit, to mining enterprises.

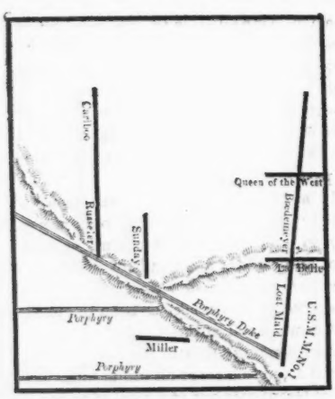
We understand that the parties who are endeavoring to float the Grant Mining Company by these questionable means, propose, if successful, to bring out another company in the same way; indeed, they have already commenced quoting this stock.

We are desirous of strengthening the new Mining Stock Board, and of interesting capital in what, with proper exercise of prudence and good judgment, is unquestionably the most profitable field for investment this country affords. We utterly repudiate, and shall expose all transactions which tend to bring mining investments into disrepute, and to drag a legitimate, reliable, and very profitable industry into the category of gambling dens or mock auctions, and we believe the American Mining Stock Board will not be slow to aid the good cause by withdrawing from their list any stock in which the transactions are of such a questionable character.

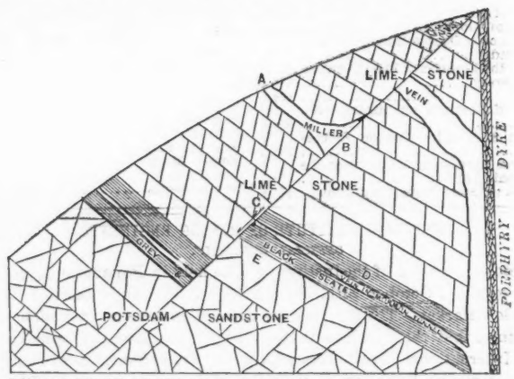
A VISIT TO AMERICAN FORK, UTAH.

Special Correspondence of the Engineering and Mining Journal.

PASSING from Alta, to American Fork Cañon, an observer will notice that the country along the base of Virginia Mountain has been extensively broken, and that upon the west side of the south fork of Little Cottonwood Creek, the rocks are uniformly of different character, though their dip and strike is generally similar to that of those along the east side of the creek, and by following up the cañon to near the Creek Mine he will see that upon the east side the granites and the oldest schists prevail, while equally as uniformly upon the west side, the limestone beds of the upper Silurian occur. Beyond the Creek Mine, and for some distance across the "divide," in American Fork District, he can trace a plain fracture in the rocks of more than ordinary extent, and though the limestones have been removed by denudation from this high and exposed point, still the difference of the rocks upon either side of the same line continues, and the schists, which have a thickness of from 1,300 to 3,000 feet, come to the surface in places on the east, while the younger sandstones prevail entirely to the west. I have traced this line of fault nearly to the Sultana Smelting Works, in American Fork Cañon, so that it extends in a direct line, at least



five miles, and passes directly through two high ranges of mountains, without perceptible deviation in its course. The age of the dislocation, as well as its course, cannot well be ascertained; at first sight it would appear probable that it was caused by a subterranean prolongation of Virginia Mountain toward the south, upheaving the strata as Virginia Mountain has evidently done, only in a less extensive manner, for we find upon the northern end of the mountain regular beds of limestone and schist, perched up upon the granite that must have been torn from the lower beds of the stratified lime and schist, which are found dipping at an angle of about 35° east, at least 1½ miles west from where these uplifted masses are now found; this would give an uplift of at least 5,000 feet to this part of the country, or in other words, the beds from which those masses were torn, may exist in place more than 5,000 feet below, so that there is abundant ground for supposing that the entire dislocation arises from the same cause, and that a subterranean mountain of granite extends through beneath the sedimentary rocks at least as far south as Miller Hill; this may account for the great number of igneous dykes found traversing the country south of Virginia Mountain, and in part for the broken and distorted condition of the ore deposits through the southern portion of Little Cottonwood and American Fork Districts. The country on either side of the fault contains innumerable veins of lead and silver ore; many of which, by their extensive outcrop and favorable ores, promised to develop into valuable mines. Quite a number have been worked to a short distance from the surface, but nearly all of them have been abandoned on account of the ore giving out, from one cause or another, but chiefly because of the extensive dislocation of the country rocks faulting the ores at slight depths, and the miners, not understanding the cause of the giving out of their ores, have abandoned in disgust "prospects" that, in other places and under other circumstances, would, in all probability, have developed into valuable properties. I have chosen as an illustration of the general character of this "giving out" of the mines, the most prominent mine yet opened in the cañon. In 1871, the Miller Mine was considered as second only to the Emma, and the capitalists of New York poured out their money as freely in the improvement of their property, as the Emma people did theirs, in the purchase of their mine. A railroad was built from the line of the Utah Southern up the cañon, a large and costly smelting establishment erected, and all the necessary buildings for men at the mine, and reduction works put up since then. The mine has never paid, and the cause cannot be better explained than by reference to the geological section made



GEOLOGICAL SECTION INCLUDING THE MILLER MINE

upon the spot, a week ago. The discovery of the mine was made at point A, and the vein found to run north-east and south-west, the dip being north-east. The vein was followed to B, where, what was supposed to be the foot wall of the vein was found, and an adit run upon the vein, from the west face of the hill intersected the main incline at this point, from near B, to C. The Hagan incline was sunk along the supposed foot wall, without developing anything. The Mormon Tunnel was then run to D, and a connection made with the the Hagan Incline at C, and nothing developed, but in the further running of the Mormon Tunnel, the small vein (marked "vein" in Mormon Tunnel) was cut and has since been followed, still prospecting for the vein was continued to the north, and the sandstone found at E, when the work in that direction ceased, near B, in the main adit, and D, in the Mormon Tunnel. Another break crosses the country in a north and south direction, carrying the western portion of the ore still lower, though this break could not be shown in the section it has exerted considerable influence upon the prospects of the mine. The direction and extent of the break shown in the section, is plainly marked upon the surface of the hill, and is, beyond doubt, the cause of the giving out of the ores of the Miller Mine. While the part of the section showing the vein in contact with the dyke of hornblende porphyry may be ideal, still I found abundant indications along the dyke of the presence of ore, in contact with it, and a shaft sunk upon the dyke itself has produced a large quantity of ore of low grade; a prospecting drift run from near B, towards the dyke, would, perhaps, be the best way to solve the question, or the vein might be found by sinking a shaft from the surface; the place to commence work in either case can be found by a survey of the ground.

The Sunday Gold Mine is one of the most noted mines in the district, chiefly because it is a gold mine. The works consist of an adit run upon the vein about 70 feet, and an incline (which is only a continuation of the adit) of about 50 feet The gold is found in grades in the sandstone, along with mispickel, gray copper, iron oxide, and pyrites. The gray copper is richer in silver than in gold. The mine is so poorly developed, and so thoroughly "sapped," that it looks rather unpromising.

The next mine to the west of the Sunday is the Russler. I had barely time to make a hurried examination of what is evidently a fine prospect. The vein is at the surface, about four feet in width, and bedded upon a deep layer of clay and decomposed quartz, which the owner told me carried $27 per ton in gold and silver, with some lead. An incline shaft has been sunk to some depth showing a fine body of mineral, upon which drifts have been run and part of the ore stoped out and sold. The vein is plainly traceable for at least 1,000 feet, showing good ore in several places. The average of the ore sold was 67 ounces of silver to the ton, and 54 per cent. lead. This is generally regarded as a high grade lead ore, as the majority of the ores worked in the Territory carry only from 12 to 32 ounces of silver to the ton.

The Sierra Mine is situated south of the Miller Mine upon the same hill. The mine is opened by an adit run upon the vein, a distance of about 200 feet and other inclines and drifts to the extent of about 800 feet more. The ore is of very high grade, averaging 470 ounces silver per ton. The vein appears to be a very regular one, though the ore is only found in pockets in the vein.

The Live Yankee, to the west of the Miller Mine, was not very lively at the time of my visit, having lain idle for the last two years. The outcrop and works show the lode to be an immense one, varying from 30 to 80 feet in width. The vein consists of bands of galena, copper and iron pyrites, and quartz. The galena is mixed with zink blende, and iron pyrites to some extent, and carries about 52 ounces in silver to the ton. The development consists of what miners call "scratching;" a few open cuts and one shaft, all of which have caved in, being, in fact, all the works upon the property.

The Bullion Mine is a good prospect, but "faulted" by a horizontal throw toward the west. It should be an easy matter to recover the vein. Assays that I have made from the vein show the ore to carry 165 ounces silver, and 43 per cent. lead. The Belle and other mines upon Miller Hill, I did not have time to examine, but from the reports of the miners, I think I have not seen all the best mines of this part of the district. The scenery in American Fork Cañon is beautiful as well as magnificent. Long stretches of smooth, grassy slopes, ending in dark groves of fir and pine, steep cliffs, and miniature waterfalls, with silvery lakes on every side, together with the eternal hills, standing in rugged grandeur around, forms a landscape worthy of a more imaginative pen than mine.

J. H. MORTON.

DEFLECTION OF GIRDERS.*

By W. S. Ayres.

HAVING felt a need of some simple formula for determining the deflection of girders of uniform cross section under any load, and through the counsel of MR. FREDERICK J. SLADE, to whom I am indebted for many suggestions, I have been led to undertake a labor of which I shall in this paper only give some of the most important features.

I am well aware that the nature of this subject is not strictly mining engineering, yet as it is a subject with which mining engineers at times have something to do, I have thought, perhaps, it might not be wholly out of place to communicate to the Institute something of the method used, and its final issue.

The results at which I have arrived agree with those obtainable from the received formula of WEISBACH, RANKINE, and others, but the expressions given by these authors, and all others that I have at hand, are of such a form that they are not easily comprehended by those who, from a want of constant use, have accumulated something of natural rust in their higher mathematical skill, and require too much labor in their application to be of practical value.

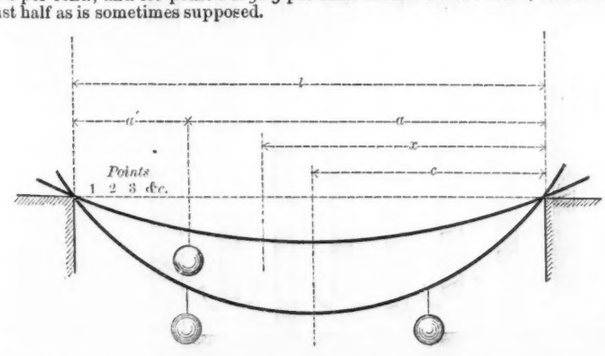
The general formula that I have adopted, is similar to that given by RANKINE, and is deflection $=\frac{m W l^3}{E I}$, in which l is the span, W the total load, E the modulus of elasticity, I the moment of inertia of the uniform cross section of the girder, and m a factor depending for its value on the mode of distribution of the load. The problem then is to find the value of this factor m in the formula, and for some distributions of the load it leads to a number of mathematical difficulties.

I this place I shall consider the girder first as loaded symmetrically with two loads, and second, as loaded at any point with only one load. Consider the half span of any girder to be divided into 20 equal parts, and loaded with two loads successfully applied at corresponding points of both halves of the span, then finding the complete integral of the expression $\frac{l-a}{2l^3} \cdot \int_o^c \int_o^c \frac{M}{Mo} \cdot dx^2$, between the limits $x=o$ and $x=c$, the point of greatest deflection, for each of these points we will have the respective values of m for each. The values of m thus determined for two loads are as given in the accompanying table. For beams symmetrically loaded, the point of greatest deflection is, of course, at the center of the span.

The values of the factor m for one load only, are set in the table opposite the corresponding points of application for two loads, and are determined by finding the complete integral of the expression $\frac{(l-a)a}{l^4} \cdot \int_o^x \int_o^x \frac{M}{Mo} \cdot dx^2$, between the limits $x=o$ and $x=$the point of greatest deflection, for each of the twenty points of the half span. In this case, the point x of lowest deflection is not at the center of the span, but is at some point between the center of the span and the load itself.

To determine this point is not easy, but after some labor it was found that $x = \sqrt{\frac{(2l-a)a}{3}}$. It was also found that the expression for the deflection in this case could be reduced to the general form, *deflection* $= \frac{W(l-a)}{EIl} \cdot \frac{x^3}{3}$, in which $x =$ the expression just given. If a, the point of application of the load, becomes equal to $\frac{l}{2}$ then this formula reduces to that of a single load applied at the center, viz., *deflection* $= \frac{W l^3}{48 E I}$, which expression is at once obtained from the general formula above given by substituting for m its value $\frac{1}{48} = .020833$ found opposite point 20 in the table.

After the deflection, and point of lowest deflection, were determined by calculation for each of the 20 points of the half span, experiments were made with beams, and the actual and calculated results for these 20 points were, I may say, exactly the same. It will be seen from a comparison of the factors m for corresponding points, and remembering that W for two loads is twice W for one load, that the deflection under one load for point 20 or the center of the span, is, as it should be, just 50 per cent. of that for two loads; for point 10 is 50·8 per cent., and for point 1 is 51·3 per cent. of that for two loads, and is not just half as is sometimes supposed.



Another interesting feature, although it scarcely needs any proof, resulting from the demonstration is that for a beam symmetrically loaded with two loads, and then still farther with additional loads, the total deflection produced is equal to the sum of the deflections produced by the different sets of symmetrical loads taken separately.

I would add that some interesting and beautiful curves are also among the results of this double integral.

Example.—If it is required to find the deflection of a beam under a single load W at say ¼ of the span, first find the value of $\frac{40a}{l} = 10$ and opposite point 10; in the table the value of m is found to be ·014558, so that the deflection $= \frac{.014558 W l^3}{E I}$.

TABLE.

Point loaded $=\frac{40a}{l}$	2 LOADS. m	1 LOAD. m		2 LOADS. m	1 LOAD. m
0	·000000	·000000	11	·015455	·015679
1	·001561	·001502	12	·016500	·016706
2	·003115	·003196	13	·017452	·017634
3	·004652	·004771	14	·018302	·018456
4	·006167	·006319	15	·019043	·019165
5	·007650	·007832	16	·019667	·019755
6	·009094	·009299	17	·020165	·020221
7	·010491	·010715	18	·020531	·020559
8	·011833	·012068	19	·020756	·020764
9	·013113	·013352	Center of span 20	·020833	·020833
10	·014323	·014558			

* A paper read before the American Institute of Mining Engineers, at the Philadelphia meeting, June, 1876.

A NEW USE OF COPPER AND ITS METALLURGY.†

By T. Sterry Hunt, LL.D., F.R.S.

THE Jones Mine (or Johannes Mine, as it was originally called, from a former proprietor), situated near Springfield, in the township of Caernarvon, Berks County, Pennsylvania, has long been known as a large deposit of magnetic iron ore, associated with more or less copper pyrites, and with malachite and chrysocolla. It occurs in a belt of soft schistose rocks, which rest upon the Laurentian gneiss of the Welsh Mountain, and to the northward are soon concealed by the unconformably-overlying mesozoic sandstone of the region. These metalliferous strata belong to the primal slates of ROGERS, which, in many other localities in this region, include similar deposits of iron ores associated with more or less copper, and often accompanied by chloritic and argillaceous schists, and, more rarely, with serpentine and small lenticular masses of crystalline limestone. To this same horizon belong the iron ores of Boyerstown, Fritz's Island, and Rondenbusch, near Reading, Wheatfield, Cornwall, and Dillsburg (all of which are found along the northern border of the mesozoic belt of the region), and, probably, also those of the Warwick Mine on the southern border.

The iron ore of the Jones Mine is found in massive beds, intercalated in the schists, and has been very extensively mined; the earlier working going back, it is said, more than a century. Some layers in the ore deposit are so charged with copper pyrites as to have been reserved as copper ores, and the adjacent schists have furnished considerable quantities of massive maladrite, which is, however, no longer found. On one side of the great open pit, in which the magnetic iron ore is now mined, there occur irregular layers of a greenish earthy-looking matter, which was found a few years since to contain considerable copper in an oxidized form. This, under the name of clay-carbonate of copper, has been mined by Mr. C. M. WHEATLEY, who has, within the last few years, extracted from shallow pits or drifts, several thousand tons of this ore, yielding from six to seven per cent. of copper. Recent excavations show that this material forms irregular layers, interstratified with the soft, and, apparently, decaying schists already noticed, which dip beneath the great mass of the magnetic iron ore. These, for a thickness of several feet, present alternations of the so-called clay ore, in a state of comparative purity, with layers of a coarser granular matter, poor in copper, the whole marked with ferruginous bands, which coincide with the bedding. These various layers are often cut by small transverse veins of quartz. For a thickness of six or eight feet, at least, the strata are charged with the cupriferous mineral, and the car-loads of the material, as now excavated, average from three to six per cent. of copper, while layers of half an inch or more in thickness, will yield ten or twelve per cent.

These pure portions have a pea-green, or apple-green color, when moist, becoming greenish-white on drying, when the mass falls into a powder, which is seen under the microscope to consist of minute, transparent, shining scales, mixed, however, with some grains of quartz, and a small portion of magnetite. A qualitative examination of this material showed that it contains no carbonates, and is not of the nature of a clay, but consists of a hydrous silicate of magnesia, copper oxide, alumina, and iron oxide, constituting a kind of copper chloride. It is but feebly attacked by dilute acids, while strong acids, and, notably, sulphuric acid diluted with two or three parts of water, and aided by a gentle heat, readily and completely decomposes it, with separation of flocculent silica, which, by solution in dilute soda-ley, is readily separated from accompanying quartz and magnetite. A single, and somewhat rough analysis, made in this way, gave me, for 100 parts—insoluble sand, 14·10; silica, 24·60; alumina, 13·00; magnesia, 15·15; ferric oxide, 7·11; cupric oxide, 15·30; water, 11·50 = 100·70. The qualitative examination of a considerable portion of another and less pure specimen, gave me an appreciable quantity of zinc, and a distinct trace of nickel.

The metallurgical treatment of this ore presented an interesting problem. From its infusible character it can only be used in small admixture in the smelting furnace, while the cost of its treatment by acids is considerable, since the copper can only be removed by the complete decomposition of the silicate by acids. Unlike chrysocolla, a simple copper silicate, which, as my friend Mr. JAMES DOUGLAS, Jr., has found, is completely decomposed when digested with a hot solution of ferrous chloride in presence of chloride of sodium. This complex silicate is very slightly attacked this solution, either before or after simple ignition. I found, however, that after heating it to low redness in a close vessel with carbonaceous matter, this ore readily gives up its copper to the action of a solution of ferrous chloride as above. The explanation of this is, doubtless, that the copper of the silicate is first reduced to the metallic state, and, subsequently, by cooling in contact with air is converted into a mixture of cupric and cuprous oxide, which readily decompose ferrous chloride with formation of cuprous and cupric chlorides. Portions of the ore, heated for three or four hours to low redness, with a small admixture of charcoal or bituminous coal dust, and then cooled in contact with air, readily gave to a hot solution of ferrous chloride, mixed with common salt, the whole of their copper, which was chiefly dissolved as cuprous chloride, as is evident from the fact that only about 47 parts of metallic iron were required to precipitate 100 parts of metallic

† A paper read before the American Institute of Mining Engineers at the Washington meeting, February, 1876.

stood than here, the company has come to New York to seek for money. Before the opening of the new Stock Board the representatives of the company offered the stock at $2.50 a share. On the opening of the Board it was quoted at $3, and has since sold, as above stated, at prices ranging from $3 to $7 per share, which would make the price of the undeveloped claim from $300,000 to $700,000. An inquiry into the nature of the sales seems to show that they are what brokers call "washed," that is, the company sells and buys its own securities through agents. In other words, it seems to be simply a *mock auction*, in which an interest is sought to be created among investors by a fictitious activity in the stock, with the hope of catching some unwary capitalist, or floating some of the stock, in order to have some one on whom to make assessments. The whole proceeding, as it appears on the surface, is entirely disreputable, and if such transactions are to be carried on under the auspices, and with the approval of the new Board, it requires no prophet to foretell its speedy dissolution, for it would simply be a curse, and not a benefit, to mining enterprises.

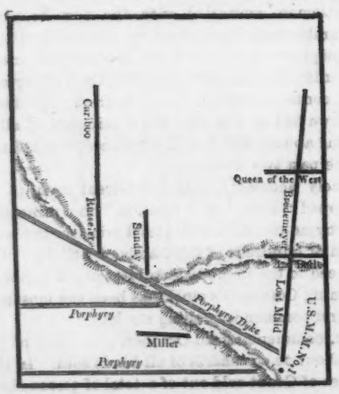
We understand that the parties who are endeavoring to float the Grant Mining Company by these questionable means, propose, if successful, to bring out another company in the same way; indeed, they have already commenced quoting this stock.

We are desirous of strengthening the new Mining Stock Board, and of interesting capital in what, with proper exercise of prudence and good judgment, is unquestionably the most profitable field for investment this country affords. We utterly repudiate, and shall expose all transactions which tend to bring mining investments into disrepute, and to drag a legitimate, reliable, and very profitable industry into the category of gambling dens or mock auctions, and we believe the American Mining Stock Board will not be slow to aid the good cause by withdrawing from their list any stock in which the transactions are of such a questionable character.

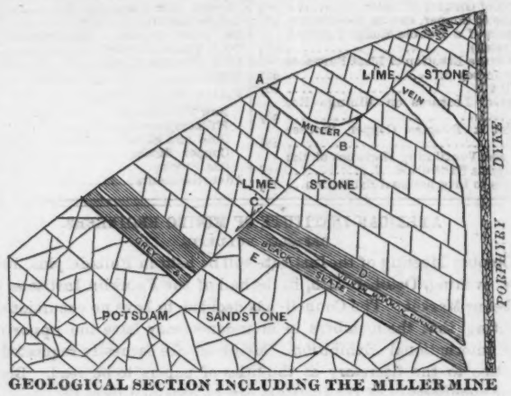
A VISIT TO AMERICAN FORK, UTAH.

Special Correspondence of the Engineering and Mining Journal.

PASSING from Alta, to American Fork Cañon, an observer will notice that the country along the base of Virginia Mountain has been extensively broken, and that upon the west side of the south fork of Little Cottonwood Creek, the rocks are uniformly of different character, though their dip and strike is generally similar to that of those along the east side of the creek, and by following up the cañon to near the Creek Mine he will see that upon the east side the granites and the oldest schists prevail, while equally as uniformly upon the west side, the limestone beds of the upper Silurian occur. Beyond the Creek Mine, and for some distance across the "divide," in American Fork District, he can trace a plain fracture in the rocks of more than ordinary extent, and though the limestones have been removed by denudation from this high and exposed point, still the difference of the rocks upon either side of the same line continues, and the schists, which have a thickness of from 1,300 to 3,000 feet, come to the surface in places on the east, while the younger sandstones prevail entirely to the west. I have traced this line of fault nearly to the Sultana Smelting Works, in American Fork Cañon, so that it extends in a direct line, at least



five miles, and passes directly through two high ranges of mountains, without perceptible deviation in its course. The age of the dislocation, as well as its course, cannot well be ascertained; at first sight it would appear probable that it was caused by a subterranean prolongation of Virginia Mountain toward the south, upheaving the strata as Virginia Mountain has evidently done, only in a less extensive manner, for we find upon the northern end of the mountain regular beds of limestone and schist, perched up upon the granite that must have been torn from the lower beds of the stratified lime and schist, which are found dipping at an angle of about 35° east, at least 1¼ miles west from where these uplifted masses are now found; this would give an uplift of at least 5,000 feet to this part of the country, or in other words, the beds from which those masses were torn, may exist in place more than 5,000 feet below, so that there is abundant ground for supposing that the entire dislocation arises from the same cause, and that a subterranean mountain of granite extends through beneath the sedimentary rocks at least as far south as Miller Hill; this may account for the great number of igneous dykes found traversing the country south of Virginia Mountain, and in part for the broken and distorted condition of the ore deposits through the southern portion of Little Cottonwood and American Fork Districts. The country on either side of the fault contains innumerable veins of lead and silver ore; many of which, by their extensive outcrop and favorable ores, promised to develop into valuable mines. Quite a number have been worked to a short distance from the surface, but nearly all of them have been abandoned on account of the ore giving out, from one cause or another, but chiefly because of the extensive dislocation of the country rocks faulting the ores at slight depths, and the miners, not understanding the cause of the giving out of their ores, have abandoned in disgust "prospects" that, in other places and under other circumstances, would, in all probability, have developed into valuable properties. I have chosen as an illustration of the general character of this "giving out" of the mines, the most prominent mine yet opened in the cañon. In 1871, the Miller Mine was considered as second only to the Emma, and the capitalists of New York poured out their money as freely in the improvement of their property, as the Emma people did theirs, in the purchase of their mine. A railroad was built from the line of the Utah Southern up the cañon, a large and costly smelting establishment erected, and all the necessary buildings for men at the mine, and reduction works put up since then. The mine has never paid, and the cause cannot be better explained than by reference to the geological section made



GEOLOGICAL SECTION INCLUDING THE MILLER MINE

upon the spot, a week ago. The discovery of the mine was made at point A, and the vein found to run north-east and south-west, the dip being north-east. The vein was followed to B, where, what was supposed to be the foot wall of the vein was found, and an adit run upon the vein, from the west face of the hill intersected the main incline at this point, from near B, to C. The Hagan incline was sunk along the supposed foot wall, without developing anything. The Mormon Tunnel was then run to D, and a connection made with the the Hagan Incline at C, and nothing developed, but in the further running of the Mormon Tunnel, the small vein (marked "vein" in Mormon Tunnel) was cut and has since been followed, still prospecting for the vein was continued to the north, and the sandstone found at E, when the work in that direction ceased, near B, in the main adit, and D, in the Mormon Tunnel. Another break crosses the country in a north and south direction, carrying the western portion of the ore still lower, though this break could not be shown in the section it has exerted considerable influence upon the prospects of the mine. The direction and extent of the break shown in the section, is plainly marked upon the surface of the hill, and is, beyond doubt, the cause of the giving out of the ores of the Miller Mine While the part of the section showing the vein in contact with the dyke of hornblende porphyry may be ideal, still I found abundant indications along the dyke of the presence of ore, in contact with it, and a shaft sunk upon the dyke itself has produced a large quantity of ore of low grade; a prospecting drift run from near B, towards the dyke, would, perhaps, be the best way to solve the question, or the vein might be found by sinking a shaft from the surface; the place to commence work in either case can be found by a survey of the ground.

The Sunday Gold Mine is one of the most noted mines in the district, chiefly because it is a gold mine. The works consist of an adit run upon the vein about 70 feet, and an incline (which is only a continuation of the adit) of about 50 feet The gold is found in grades in the sandstone, along with mispickel, gray copper, iron oxide, and pyrites. The gray copper is richer in silver than in gold. The mine is so poorly developed, and so thoroughly "sapped," that it looks rather unpromising.

The next mine to the west of the Sunday is the Russler. I had barely time to make a hurried examination of what is evidently a fine prospect. The vein is at the surface, about four feet in width, and bedded upon a deep layer of clay and decomposed quartz, which the owner told me carried $27 per ton in gold and silver, with some lead. An incline shaft has been sunk to some depth showing a fine body of mineral, upon which drifts have been run and part of the ore stoped out and sold. The vein is plainly traceable for at least 1,000 feet, showing good ore in several places. The average of the ore sold was 67 ounces of silver to the ton, and 54 per cent. lead. This is generally regarded as a high grade lead ore, as the majority of the ores worked in the Territory carry only from 12 to 32 ounces of silver to the ton.

The Sierra Mine is situated south of the Miller Mine upon the same hill. The mine is opened by an adit run upon the vein, a distance of about 200 feet and other inclines and drifts to the extent of about 800 feet more. The ore is of very high grade, averaging 470 ounces silver per ton. The vein appears to be a very regular one, though the ore is only found in pockets in the vein.

The Live Yankee, to the west of the Miller Mine, was not very lively at the time of my visit, having lain idle for the last two years. The outcrop and works show the lode to be an immense one, varying from 30 to 80 feet in width. The vein consists of bands of galena, copper and iron pyrites, and quartz. The galena is mixed with zink blende, and iron pyrites to some extent, and carries about 52 ounces in silver to the ton. The development consists of what miners call "scratching;" a few open cuts and one shaft, all of which have caved in, being, in fact, all the works upon the property.

The Bullion Mine is a good prospect, but "faulted" by a horizontal throw toward the west. It should be an easy matter to recover the vein. Assays that I have made from the vein show the ore to carry 165 ounces silver, and 43 per cent. lead. The Belle and other mines upon Miller Hill, I did not have time to examine, but from the reports of the miners, I think I have not seen all the best mines of this part of the district. The scenery in American Fork Cañon is beautiful as well as magnificent. Long stretches of smooth, grassy slopes, ending in dark groves of fir and pine, steep cliffs, and miniature waterfalls, with silvery lakes on every side, together with the eternal hills, standing in rugged grandeur around, forms a landscape worthy of a more imaginative pen than mine.

J. H. MORTON.

DEFLECTION OF GIRDERS.*

By W. S. Ayres.

Having felt a need of some simple formula for determining the deflection of girders of uniform cross section under any load, and through the counsel of Mr. Frederick J. Slade, to whom I am indebted for many suggestions, I have been led to undertake a labor of which I shall in this paper only give some of the most important features.

I am well aware that the nature of this subject is not strictly mining engineering, yet as it is a subject with which mining engineers at times have something to do, I have thought, perhaps, it might not be wholly out of place to communicate to the Institute something of the method used, and its final issue.

The results at which I have arrived agree with those obtainable from the received formula of Weisbach, Rankine, and others, but the expressions given by these authors, and all others that I have at hand, are of such a form that they are not easily comprehended by those who, from a want of constant use, have accumulated something of natural rust in their higher mathematical skill, and require too much labor in their application to be of practical value.

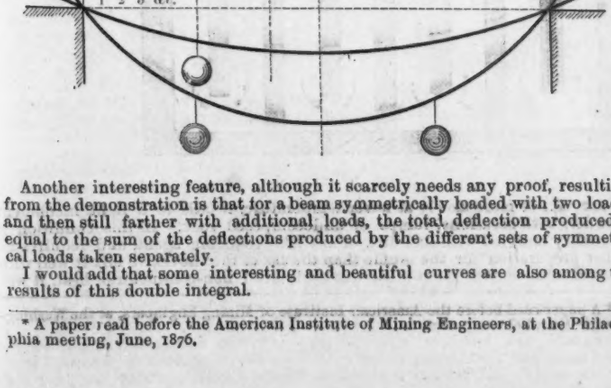
The general formula that I have adopted, is similar to that given by Rankine, and is deflection $=\frac{mWl^3}{EI}$, in which l is the span, W the total load, E the modulus of elasticity, I the moment of inertia of the uniform cross section of the girder, and m a factor depending for its value on the mode of distribution of the load. The problem then is to find the value of this factor m in the formula, and for some distributions of the load it leads to a number of mathematical difficulties.

I this place I shall consider the girder first as loaded symmetrically with two loads, and second, as loaded at any point with only one load. Consider the half span of any girder to be divided into 20 equal parts, and loaded with two loads successfully applied at corresponding points of both halves of the span, then finding the complete integral of the expression $\frac{l-a}{2l^3}\cdot\int_o^c\int_o^c\frac{M}{Mo}\cdot dx^2$, between the limits $x=o$ and $x=c$, the point of greatest deflection, for each of these points we will have the respective values of m for each. The values of m thus determined for two loads are as given in the accompanying table. For beams symmetrically loaded, the point of greatest deflection is, of course, at the center of the span.

The values of the factor m for one load only, are set in the table opposite the corresponding points of application for two loads, and are determined by finding the complete integral of the expression $\frac{(l-a)a}{l^4}\cdot\int_o^x\int_o^x\frac{M}{Mo}\cdot dx^2$, between the limits $x=o$ and $x=$the point of greatest deflection, for each of the twenty points of the half span. In this case, the point x of lowest deflection is not at the center of the span, but is at some point between the center of the span and the load itself.

To determine this point is not easy, but after some labor it was found that $x=\sqrt{\frac{(2l-a)a}{3}}$. It was also found that the expression for the deflection in this case could be reduced to the general form, *deflection* $=\frac{W(l-a)}{EIl}\cdot\frac{x^3}{3}$, in which $x=$ the expression just given. If a, the point of application of the load, becomes equal to $\frac{l}{2}$ then this formula reduces to that of a single load applied at the center, viz., *deflection* $=\frac{Wl^3}{48EI}$, which expression is at once obtained from the general formula above given by substituting for m its value $\frac{1}{48}=$ ·020833 found opposite point 20 in the table.

After the deflection, and point of lowest deflection, were determined by calculation for each of the 20 points of the half span, experiments were made with beams, and the actual and calculated results for these 20 points were, I may say, exactly the same. It will be seen from a comparison of the factors m for corresponding points, and remembering that W for two loads is twice W for one load, that the deflection under one load for point 20 or the center of the span, is, as it should be, just 50 per cent. of that for two loads; for point 10 is 50·8 per cent., and for point 1 is 51·3 per cent. of that for two loads, and is not just half as is sometimes supposed.



Another interesting feature, although it scarcely needs any proof, resulting from the demonstration is that for a beam symmetrically loaded with two loads, and then still farther with additional loads, the total deflection produced is equal to the sum of the deflections produced by the different sets of symmetrical loads taken separately.

I would add that some interesting and beautiful curves are also among the results of this double integral.

Example.—If it is required to find the deflection of a beam under a single load W at say ¼ of the span, first find the value of $\frac{40a}{l}=10$ and opposite point 10; in the table the value of m is found to be ·014558, so that the deflection $=\frac{·014558\,W\,l^3}{EI}$.

TABLE.

Point loaded $=\frac{40a}{l}$	2 Loads. m	1 Load. m		2 Loads. m	1 Load. m
0	·000000	·000000	11	·015455	·015679
1	·001561	·001502	12	·016500	·016706
2	·003115	·003196	13	·017452	·017634
3	·004652	·004771	14	·018302	·018456
4	·006167	·006319	15	·019043	·019165
5	·007650	·007832	16	·019667	·019755
6	·009094	·009299	17	·020165	·020221
7	·010491	·010715	18	·020531	·020559
8	·011833	·012068	19	·020756	·020764
9	·013113	·013352	Center of span 20	·020833	·020833
10	·014323	·014558			

A NEW USE OF COPPER AND ITS METALLURGY.†

By T. Sterry Hunt, LL.D., F.R.S.

The Jones Mine (or Johannes Mine, as it was originally called, from a former proprietor), situated near Springfield, in the township of Caernarvon, Berks County, Pennsylvania, has long been known as a large deposit of magnetic iron ore, associated with more or less copper pyrites, and with malachite and chrysocolla. It occurs in a belt of soft schistose rocks, which rest upon the Laurentian gneiss of the Welsh Mountain, and to the northward are soon concealed by the unconformably-overlying mesozoic sandstone of the region. These metalliferous strata belong to the primal slates of Rogers, which, in many other localities in this region, include similar deposits of iron ores associated with more or less copper, and often accompanied by chloritic and argillaceous schists, and, more rarely, with serpentine and small lenticular masses of crystalline limestone. To this same horizon belong the iron ores of Boyerstown, Fritz's Island, and Rondenbusch, near Reading, Wheatfield, Cornwall, and Dillsburg (all of which are found along the northern border of the mesozoic belt of the region), and, probably, also those of the Warwick Mine on the southern border.

The iron ore of the Jones Mine is found in massive beds, intercalated in the schists, and has been very extensively mined; the earlier working going back, it is said, more than a century. Some layers in the ore deposit are so charged with copper pyrites as to have been reserved as copper ores, and the adjacent schists have furnished considerable quantities of massive maladrite, which is, however, no longer found. On one side of the great open pit, in which the magnetic iron ore is now mined, there occur irregular layers of a greenish earthy-looking matter, which was found a few years since to contain considerable copper in an oxidized form. This, under the name of clay-carbonate of copper, has been mined by Mr. C. M. Wheatley, who has, within the last few years, extracted from shallow pits or drifts, several thousand tons of this ore, yielding from six to seven per cent. of copper. Recent excavations show that this material forms irregular layers, interstratified with the soft, and, apparently, decaying schists already noticed, which dip beneath the great mass of the magnetic iron ore. These, for a thickness of several feet, present alternations of the so-called clay ore, in a state of comparative purity, with layers of a coarser granular matter, poor in copper, the whole marked with ferruginous bands, which coincide with the bedding. These various layers are often cut by small transverse veins of quartz. For a thickness of six or eight feet, at least, the strata are charged with the cupriferous mineral, and the car-loads of the material, as now excavated, average from three to six per cent. of copper, while layers of half an inch or more in thickness, will yield ten or twelve per cent.

These pure portions have a pea-green, or apple-green color, when moist, becoming greenish-white on drying, when the mass falls into a powder, which is seen under the microscope to consist of minute, transparent, shining scales, mixed, however, with some grains of quartz, and a small portion of magnetite. A qualitative examination of this material showed that it contains no carbonates, and is not of the nature of a clay, but consists of a hydrous silicate of magnesia, copper oxide, alumina, and iron oxide, constituting a kind of copper chloride. It is but feebly attacked by dilute acids, while strong acids, and, notably, sulphuric acid diluted with two or three parts of water, and aided by a gentle heat, readily and completely decomposes it, with separation of flocculent silica, which, by solution in dilute soda-ley, is readily separated from accompanying quartz and magnetite. A single, and somewhat rough analysis, made in this way, gave me, for 100 parts—insoluble sand, 14·10; silica, 24·60; alumina, 13·00; magnesia, 15·15; ferric oxide, 7·11; cupric oxide, 15·30; water, 11·50 = 100·70. The qualitative examination of a considerable portion of another and less pure specimen, gave me an appreciable quantity of zinc, and a distinct trace of nickel.

The metallurgical treatment of this ore presented an interesting problem. From its infusible character it can only be used in small admixture in the smelting furnace, while the cost of its treatment by acids is considerable, since the copper can only be removed by the complete decomposition of the silicate by acids. Unlike chrysocolla, a simple copper silicate, which, as my friend Mr. James Douglas, Jr., has found, is completely decomposed when digested with a hot solution of ferrous chloride in presence of chloride of sodium. This complex silicate is very slightly attacked this solution, either before or after simple ignition. I found, however, that after heating it to low redness in a close vessel with carbonaceous matter, this ore readily gives up its copper to the action of a solution of ferrous chloride as above. The explanation of this is, doubtless, that the copper of the silicate is first reduced to the metallic state, and, subsequently, by cooling in contact with air is converted into a mixture of cupric and cuprous oxide, which readily decompose ferrous chloride with formation of cuprous and cupric chlorides. Portions of the ore, heated for three or four hours to low redness, with a small admixture of charcoal or bituminous coal dust, and then cooled in contact with air, readily gave to a hot solution of ferrous chloride, mixed with common salt, the whole of their copper, which was chiefly dissolved as cuprous chloride, as is evident from the fact that only about 47 parts of metallic iron were required to precipitate 100 parts of metallic

* A paper read before the American Institute of Mining Engineers, at the Philadelphia meeting, June, 1876.

† A paper read before the American Institute of Mining Engineers at the Washington meeting, February, 1876.

copper from the colorless solution. These reactions have since been utilized, so that several thousand pounds of this ore are now treated daily at the works of the Chemical Copper Company, at Phœnixville, Pa., for the extraction of the copper.

Appendix.—A portion of the specimen of this copper silicate, of which the analysis has been given above, was freed by careful washing alike from the coarser grains, and from the lightest portion which remained long suspended in water. The material thus purified was somewhat richer in copper, and has been carefully analyzed by my friend, Mr. GEORGE W. HAWES, of New Haven, who found insoluble 6·22, silica, 28·93, alumina, 13·81, ferric oxide, 5·04, ferrous oxide, 0·27, magnesia, 17·47, cupric oxide, 16·55, water, 12·08=100·37. Thus, deducting the insoluble quartz, gives for 100 parts: silica, 30·73, alumina, 14·67, ferric oxide, 5·35, ferrous oxide, 0·29, magnesia, 18·55, cupric oxide, 17·58, water, 12·83=100·00. This, as remarked by Mr. HAWES, gives, on calculation, an oxygen ratio between sesquioxide, protoxide, silica, and water, of 4:3:6:4, very nearly, which puts this mineral, if it be a homogeneous substance, among the chlorides, some of which it resembles very closely in its atomic ratios. Under the microscope it appears to be made up of little scales. Before the blowpipe on charcoal it swells, then fuses quietly into a black globule, giving the usual reactions for copper. The iron is almost all in the state of sesquioxide, and proved by a duplicate determination of the amount of protoxide. The two gave, respectively, 0·27 and 0·29.

This copper chloride appears alike, from its physical and chemical characters, to constitute a distinct mineral species, for which I propose the name of *venerite*, in allusion to the mythological and alchemistic name of coppers.

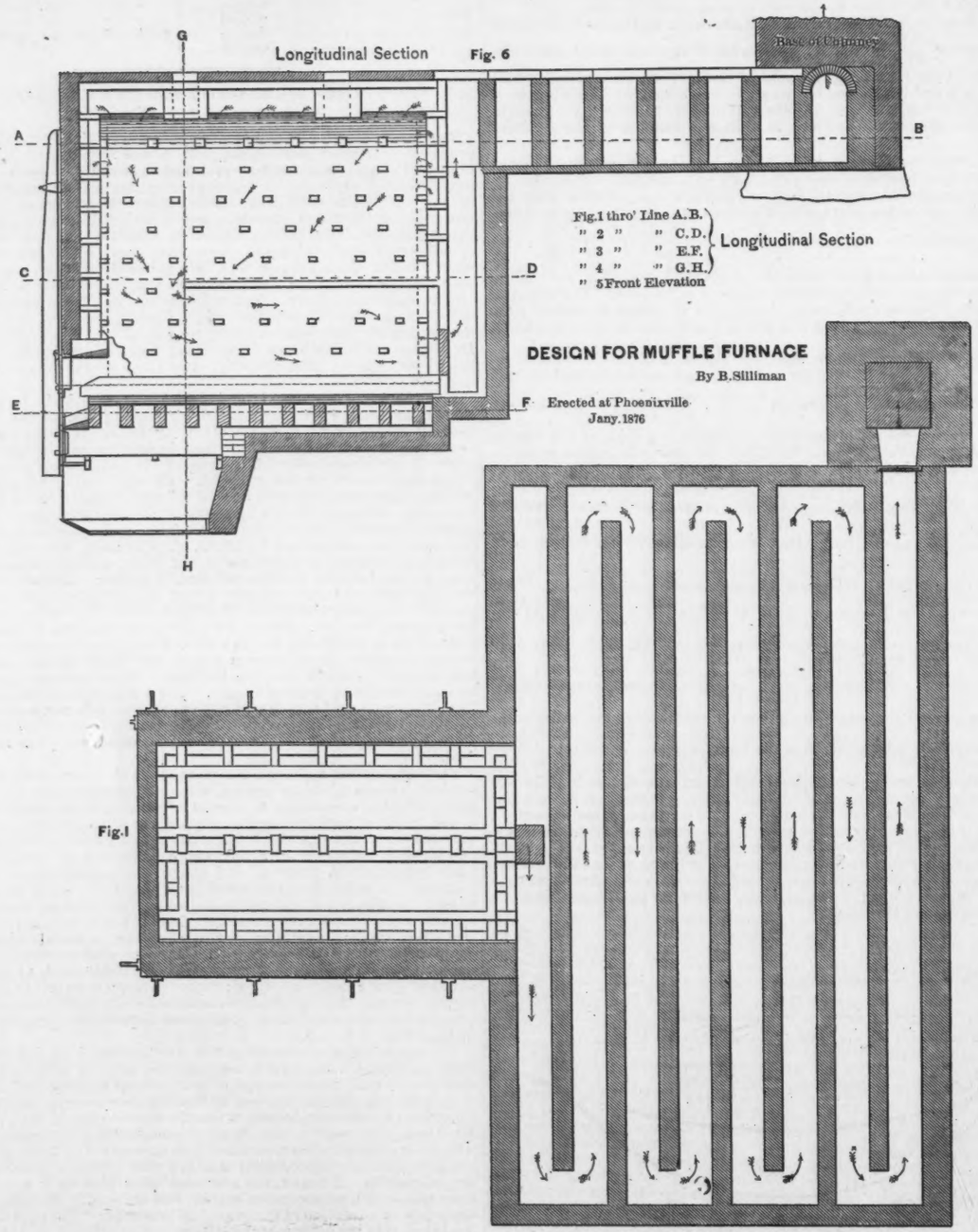
DESCRIPTION OF A DOUBLE MUFFLE FURNACE.

Designed for the Reduction of Hydrous Silicates Containing Copper, etc., Like the So-called "Clay Ore" of Jones' Mine in Pennsylvania.*

By Prof. B. Silliman.

THE experiments detailed by Dr. HUNT, having demonstrated the fact that the copper contained in the "clay ore" of Jones' Mine, was rendered completely soluble in the bath of ferrous chloride, used in the HUNT & DOUGLAS process, after heating in contact with carbonaceous matter in a close vessel; I set myself to devise a form of muffle furnace adapted to the treatment of large quantities of these and similar ores by a continuous process. The result is shown in the accompanying diagrams, reduced from the working drawings, after which this furnace was built early in 1876, at Phœnixville, by the Chemical Copper Company on their works at this place.

The peculiar character of this one determined the form, dimensions, and position, with reference to charging and discharging of these muffles. The ore arrived from the mine with from 20 to 25 per cent. of mixture, and when dried at 212° F., or more slowly at lower temperature, it falls to a light incoherent powder, with occasional lumps of undecomposed rock. In this condition it is readily mingled with coal dirt, or any like reducing agent, and requires no other preparation for the muffle than the use of the shovel, to mix it well with the reducing agent. As it is a remarkably good non-conductor of heat, it was



* A paper read before the American Institute of Mining Engineers, at the Washington meeting, February, 1876.

obvious that the mass to be heated though in a reasonable time, must not be too thick, while the weight of the mass must be sustained in a way to avoid undue strain upon the walls of the muffle. These walls must be as thin as practicable, to favor the more rapid transmission of heat, and must therefore be so constructed as to admit of being staged on the sides at frequent intervals to resist the lateral thrust of the very mobile mass of pulverulent ore, which, for obvious reasons, must be charged at the top and drawn from the bottom of each chamber. These considerations led to the form adopted, viz.: two vertical muffles, standing upon very strong bridge tiles, seen in horizontal section, on the line E.F., and in plan in Fig. 3, on the same plane. The vertical section of the muffle is seen in Fig. 4, drawn in the plane G. H., of the longitudinal section, Fig. 6, which is the key to all sections.

The walls of the muffles are built of the best fire-brick, very carefully laid, one course thick (about 4½ inches), and banded to the surrounding walls at frequent intervals, as seen in Figs. 4 and 6. The dimensions of the muffle chambers are each, in height 10 feet, in depth 12 feet, and in width 2 feet, calculated to hold from 14,000 to 15,000 pounds each of dry ore. This ore, as mined, measures about 33 cubic feet to the miner's ton of 2,352 pounds, and by drying suffers very little change of volume, the cubic foot of dry ore weighing about 75 pounds. It was expected that this volume of ore could be treated in from 24 to 36 hours, the chief ground for this expectation being the action of the gas retorts, which afforded the nearest known term of comparison. We shall see beyond how far this expectation was realized in actual experience. The fire-place, seen in Figs. 3, 4, and 6, was placed centrally beneath the two muffles, and the course of the heat is clearly indicated by the arrows seen in the several sections, being in the main outward from the fire, and then upward, by way of the outer walls, and downward again between the muffles, where the current is directed by a horizontal diaphragm seen in longitudinal section, Fig. 6, compelling the escaping gases to seek the ascending flue to the drying floors and chimney only after enveloping the whole area of the muffle walls. In this as in all points of detail, I was greatly aided by the long experience of Mr. WM. EDMONDSON in building gas furnaces. The effect of this mode of distribution of the heat is all that could be desired, giving a remarkably uniform temperature to all parts of the muffles. The drying floor exposes an area of over 500 square feet of surface, beneath which the heat passes on its way to the chimney, as seen in Fig. 1, the flues being covered by large flat tiles sustained on the dividing walls, as seen in Fig. 6. Each muffle is provided with two charging holes, as seen in Fig. 6, covered by an iron plate, perforated with a gas tube for the escape of gases and vapor given off in the process, and serving also as convenient handles for opening the feed-holes. The doors of discharge are seen on Figure 2, counterpoised and rising in vertical guides, the wagons to receive the reduced ore being placed immediately under the discharge.

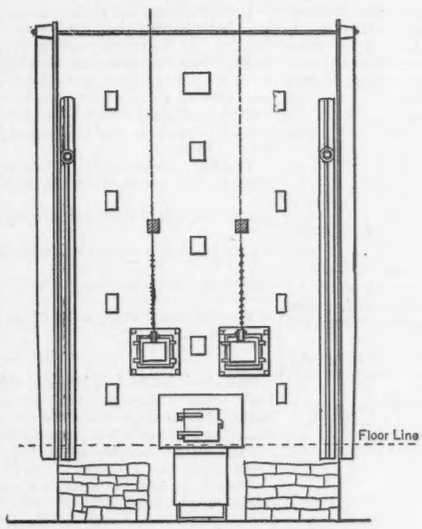


Fig.5

Scale 6 feet to 1 Inch

Drawn by Wm. Edmondson

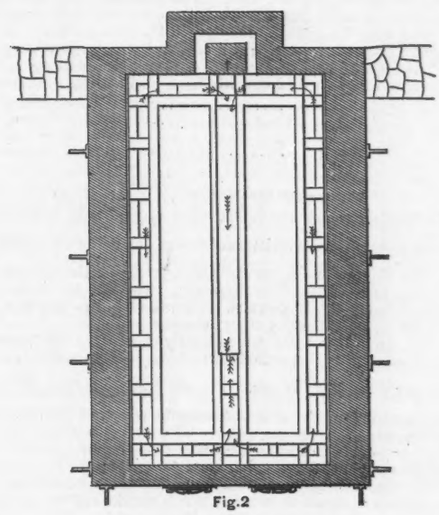


Fig.2

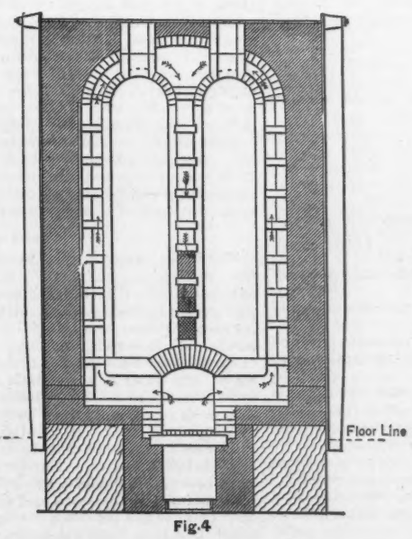


Fig.4

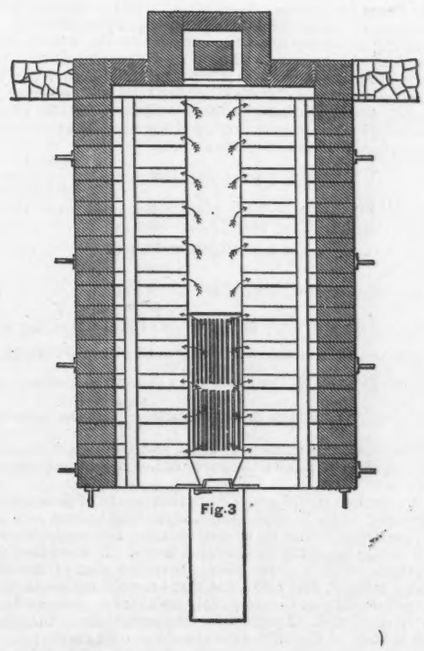


Fig.3

The chemical reaction by which in these muffles the copper silicate is reduced to metallic copper is sufficiently simple, and may occur either by the direct action of carbon on the cupric oxide, $C+CuO=CO+Cu$, or by the joint action of hydrocarbon gases and carbonous oxide on the copper oxide producing water and carbon dioxide. Practically it was soon discovered that anthracite dust alone worked quite too slow, and required by far too high a temperature to be of any economic value. Charges thus treated remaining, even after 80 hours continuous treatment, only partially reduced. The dust of bituminous coal worked much more efficiently, the reduction being quite complete, but the time required being still greatly in excess of what was expected, or indeed requisite, as the result proves. But their mode of treatment was followed for many months, and with excellent results—the reduction being quite complete. With the use of about one-tenth of bituminous coal dust to the charge of dry ore, the verticals being incorporated upon the drying floor, and about 1,500 lb. of dust to the charge being used, the time consumed on the reduction was about 60 hours. This was too long, reducing the effective result of the muffles in the amount of ore to be treated, and increasing unduly the consumption of fuel. Resort was then had to coal-tar, one barrel of which (about 400 lb.) taking the place of 1,500 lb. of bituminous coal dust, and completely reducing the charge in about 30 hours, and at a lower temperature than is required with the use of coal dust. It is easy to see why this should be so. Coal-tar is a liquid hydrocarbon, deprived, in the act of its production from bituminous coal, of all light products, volatile at temperatures much below redness, but capable, at a high temperature, of conversion into heavy hydrocarbon vapors. When coal-tar is commingled, therefore, with the dry ore, and the charge is thrown into the muffles, no chemical action takes place until the mass reaches the temperature of dull redness in the dark (under 500° C.), at which temperature it is known that reduction of iron ferric oxides occurs in a stream of hydrocarbon gases. But at this temperature the coal-tar begins to give off vapors abundantly, which, penetrating the already heated mass at the opportune moment, do the work of reduction with rapidity and very thoroughly. Now, with anthracite dust, charcoal dust, or dust of coke, the reaction is at first only between the carbon and the oxygen of the ores, and this can happen only at a much higher temperature, and more slowly; the carbonous oxide found next reacting with the cupric oxide to form CO_2. With bituminous coal dust a considerable part of the hydrocarbon gases are given off at a temperature below the reducing point of the copper salt, and are thus practically lost, while the coke remaining acts slowly, for reasons already stated, as well as being mechanically in a disadvantageous condition. Hence, the time consumed in effecting the decomposition is, by far, too great, even with bituminous coal. But the coal-tar leaves nothing to be desired, and when it is employed the proportion and dimensions of the muffles appear to have been calculated almost exactly for the desired result. Only in the mode of heating them is there room for an important improvement. The use of a gas producer has been decided on to fill one or both the spaces seen upon the sides of the muffle in Fig. 1, and by this mode of heating a more efficient and economical result may reasonably be expected. It is proper to add that nine months' continuous use of these muffles has demonstrated their efficiency and economy, as no repairs have been required in the apparatus, and the renewal of the fire-box will be rendered unnecessary by the introduction of a gas furnace. The beautiful display of burning zinc, with its faint amount of glow of lambent green flames amid the orange glow of the incandescent ore, as the charges were drawn into the wagons, by night, was described at the Washington meeting as one of the most beautiful

of metallurgical phenomena. This happens only when the temperature is higher than has been found needful in steady working, and near that at which the ore slags. Consequently, it is no longer seen as the process is now conducted. The reduced copper is oxidized at once by the air on drawing the charge, and in this condition is readily dissolved in the HUNT & DOUGLAS bath. A remarkable change is seen in the texture of the calcined ore, which is thus rendered quite granular and free to the passage of the liquors of the bath, while before heating, and the consequent loss of water of hydration, it is quite impervious to water.

PROJECT FOR THE ERECTION OF BLAST FURNACES IN NEW JERSEY.

By William Kent, M.E.

(Concluded from page 247.)

HEATING POWER OF THE WASTE GASES.

THE calculated composition of the waste gases, as already given, is :

Carbonic oxide	30·25
Carbonic acid	9·30
Nitrogen	58·78
Hydrogen, water, and volatile matter	1 97
	100 00

These are supposed to have a heating power sufficient to raise steam for the engines and to heat the blast. The heating power is derived from two sources, 1st, their sensible heat, and 2d, the combustion of their carbonic oxide.

Assuming the gases as they reach the boilers and ovens to have a temperature of 500° F., we arrive at a measure of their heating power as follows :

The specific heat of the gases is found by multiplying the percentage of each constituent by its own specific heat, and adding the results, thus :

CO	30·25	× 0·2479	=	7·499
CO_2	9·30	× 0·2164	=	2·013
N	58·78	× 0·2440	=	14·342
H_2O	1·67	× 0 480	=	0·802
	100°			24·656

Whence the specific heat = 0·246

The heating power due to the temperature, then, is $468 \times 0{\cdot}246 = 115{\cdot}13$ thermal units per pound. The heating power due to the combustion is $\frac{30{\cdot}25}{100} \times 4{,}325 =$ 1308·31 thermal units per pound (4,325 being the heat of combustion of CO according to FAVRE and SILBERMANN). The weight of the gases discharged per minute being 650·02 pounds, their total heating power above 32° F. is $650{\cdot}02 \times (115{\cdot}13 + 1308{\cdot}31^{*}) = 925{,}264{\cdot}47$ thermal units.

The amount of air theoretically necessary to burn these gases is that whose oxygen is just sufficient to burn the CO to CO_2, or 0·1729 pounds of oxygen per pound of the gas. The air corresponding to this is $0{\cdot}1729 \times \frac{100}{23{\cdot}01} =$ 0·7514 pounds. The amount *actually* required in practice is at present unknown, for there appear to have been no experiments made on the subject, nor are there any analyses on record of the escaping gases in the chimneys of the boilers or ovens, from which such amount might be calculated.

It is asserted by various authorities on combustion, that in ordinary coal fires, from 1½ times to twice as much air should be supplied as is necessary to burn the carbon of the fuel to carbonic acid.

Temperature of the Ignited Gases.—Assuming a like figure in the present case, viz.: that twice as much air is required to burn the gas as is theoretically necessary, or $\cdot7514 \times 2 = 1{\cdot}5028$ pounds per pound of the gas, we have a means of arriving at the probable temperature of the fire in the ovens and under the boilers. According to RANKINE—"The elevation of temperature of the fire above the temperature at which the air and fuel are supplied to the furnace may be computed, by dividing the total heat of combustion of one pound of fuel by the weight and by the specific heat of the whole products of its combustion, and of the air employed for their dilution under constant pressure." Applying this rule, we have :

$$\text{Elevation of temperature} = \frac{1308{\cdot}31}{1 \times {\cdot}24656 + 1{\cdot}5028 \times 2377} = 2167^{\circ}\text{F.}$$

To this must be added the average temperature of the gases and the air supplied (the latter, say at 60°F.), which is

$$\frac{1 \times 500^{\circ} + 1{\cdot}5028 \times 60}{2{\cdot}5028} = 236^{\circ}\text{F.}$$

The "temperature of the fire" is, therefore,

$$2167 + 236 = 2402^{\circ}\text{F.}$$

which is far above the temperature of ignition of the waste gases.

If by more economical working of the furnace itself the ratio $\frac{CO_2}{CO}$ be increased, the temperature of the fire will be diminished, as will also the heating power of the gases. Although then the ratio $\frac{CO_2}{CO}$ is the index of the calorific efficiency of the furnace, as stated by BELL and GRUNER, it must by no means be so much increased as to render the gases either incombustible, or of insufficient heating power.

The writer would suggest another means of determining the index of calorific efficiency of the furnace plant, including boilers and ovens, rather than of the furnace itself; that is, by determining the analysis of the gases escaping by the chimneys of the boilers and ovens. It is evident that there should be no carbonic oxide in these gases, otherwise part of the fuel is escaping without being burned, and also, that there should not be an unnecessary excess of atmospheric air, as this is merely an agent to remove heat which should be usefully employed. Pyrometric determinations of the temperature of the gases in the bottom of the chimneys should also be made.

If the gases as thus analyzed are found to be of the proper composition, with no unburdened carbonic oxide, and a minimum amount of atmospheric air, and there is neither blowing off of steam from the safety valves, nor excessive heat in the ovens and blast pipes, and consequent excessive loss by radiation, it would appear that the furnace must be working with maximum efficiency, and that all the heat originally contained in the fuel supplied to the furnace, over and above that used to generate steam and to heat the blast, to cause the proper draught in the chimneys, and to supply the ordinary loss by radiation and other like causes, is being used in the furnace, to fulfil its proper function—the reduction and smelting of the ore and slag.

Index of Efficiency.—The new index of calorific efficiency, then, is *the ratio of the total weight of the gases escaping by the chimneys of the boilers and ovens to the weight of free atmospheric air, or free oxygen, contained in them*, provided that at the same time they contain no carbonic oxide.

It will not be necessary, in obtaining this ratio to make a complete analysis of the escaping gases; in general the proportion of free oxygen, nitrogen, or carbonic acid alone will be sufficient, and from the known analysis of the charges the remainder may be calculated.

Economy of the Gases.—Referring again to the calculation of the supposed heating power of the waste gases, which we found to be 925264·27 thermal units per minute, let us compare this amount with that which is required by the boilers and ovens. It has been seen that the furnace requires, when working on 48·22 per cent. ores, under the same conditions as those assumed in calculating the heating power of the gases, 495·97 pounds of air per minute. To heat this quantity of air from 60° F. to 1,000° F. requires $495{\cdot}67 \times 940^{\circ} \times 0{\cdot}2377 = 110971{\cdot}51$ thermal units. The boilers are required to evaporate 15417·49 pounds of water per hour, or 256·96 pounds per minute from feed water of say 120° F. to steam at 35 pounds total pressure. This requires, even if all evaporated into dry steam (priming was assumed in the calculation which gave 15417.49 pounds), $256{\cdot}96 \times 1073 = 275718{\cdot}08$ thermal units.

If we suppose the boilers to have an efficiency of 70 per cent., and the ovens an efficiency of only 50 per cent., the total quantity of heat required will be : boilers, 393,883 units ; ovens, 221,943 units ; total, 615,826 units per minute. Subtracting this from the heating power of the gases as found, 925,264 units, we have 309,438 heat units per minute, which represents an absolute waste, or heat thrown away which should be applied to some useful purpose. The heat units in anthracite coal being about 13,500 per pound, this waste is equivalent to 22·9 pounds of coal per minute, or 5,373 tons per year, worth over $20,000 for the furnace.

The only fallacy which seems possible in the argument leading to this rather starting conclusion, is in the first assumption of the composition of the waste gases, viz., that they contain 15·5 per cent. of carbon, with a ratio $\frac{CO_2}{CO} =$ 0·3074 ; but this analysis is seen to be not far from those obtained in practice, and in fact has a smaller carbon percentage, and a higher $\frac{CO_2}{CO}$ ratio than either of the calculated analyses of gases of Pennsylvania furnaces, which have already been given.

STOCK-HOUSE AND ELEVATORS.

The stock-house is a brick building 300 feet long, 60 feet wide, and 30 feet high, with a transept extending at right angles from the middle of the main building toward the canal, 60 feet wide and 20 feet long. Three railroad tracks pass through the house on trestles fourteen feet high. The storage capacity of the house, considering it fourteen feet high in the main building, and twenty feet high in the transept, is 276,000 cubic feet. Estimating the consumption of the two furnaces to be about 1,200 tons of ore, 900 tons of coal and 200 tons of limestone per week, and the storage capacity required for a ton of ore to be twelve cubic feet, for a ton of coal forty cubic feet, and for a ton of limestone twenty cubic feet, we find that the house has sufficient room to contain a five weeks' stock. In case it is deemed advisable to lay in a large stock by canal during the Summer and Fall, to last during the close of navigation, one or two of the tracks in the stock-house may be blocked up and the stock piled above them. An extra stock of ore may be piled outside of the stock-house, under the trestle work approach from the railroad.

There are two elevators, or hoists, for raising the stock to the top of the furnace, of the pneumatic type, as patented by Messrs. TAWS & HARTMAN. They are now in use at a large number of furnaces throughout the country, and appear to give complete satisfaction. The cages attached to each elevator are of size sufficient to carry four barrows of stock, and containing about 600 pounds. The total pressure on the piston is, therefore, required to raise 2,400 pounds plus the weight of the wire rope and the resistance of friction, the weight of the cage and barrows being balanced by the weighted piston. The size of cylinder most commonly used is thirty-six inches, which is sufficient to raise the stock if only three pounds of air pressure per square inch is above the piston.

Estimating a maximum production at each furnace of fifty tons of iron per day, requiring 200 tons of stock, and the elevator to raise one ton at each lift, there will be required 200 lifts per day, or one lift about every seven minutes. In case of a break-down at either of the hoists, the remaining one may be made to do the work of both by running it more rapidly.

WATER SUPPLY, TUYERES, ETC.

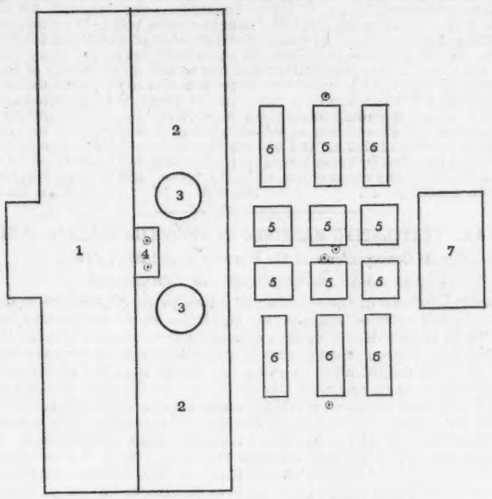
The water supply for the tuyeres, boilers, and condensers, is obtained from the river which runs near the furnace. An underground pipe brings the water to a well under the engine-house, whence it is drawn to the condensers and pumped to the tanks which supply the tuyeres. There is a tuyere water-tank for each furnace, twenty feet long by eight feet wide and six feet high, stayed inside with iron rods, and supported on pillars just beneath the roof of the casting-house between the furnaces. The pumps, tuyeres, water pipes, waste pipes, and other minor details may be of any of the ordinary types, and it is not necessary to describe them here.

As seen in the subjoined sketch of the ground plan, the stock-house and casting-house are built parallel to the canal, and adjoining each other, the center wall being common to both. The two stacks are placed seventy feet apart between centers. The two elevators are contained in one elevator-house, built between the stacks, the bottom part of one of its walls being part of the wall common to the stock and casting houses. The descending gas flues from each furnace are led down through the roof of the casting-house, seventy feet apart, and then pass out through embrasures in the wall to the boilers and ovens. The ovens occupy the ground between the flues and the boilers on the outside of them. Beyond the boilers and ovens, and the ends of the flues, stands the engine-house, containing the two engines, the air receivers, and the pumps, besides room for general supplies of the furnace.

The writer is not aware that precisely this arrangement is employed at any furnace now built, but believes it has some advantages over any that he has seen. In building the stock and casting-houses parallel, and with a common wall between them, a large amount of wall is saved over that plan in which the casting-houses are at right angles to the stock-house, and separated from each other by the boiler and oven space, as in designs very commonly followed. The common wall also need not be built solid, but may consist merely of

* MORIN and TRESCA gave 1,620 as the heating power of gas from iron furnaces—(TROWBRIDGE). This, probably, contained more hydrogen than that treated of in this project.

pillars and arches sufficient to sustain the weight of the roof. The one elevator-house sufficing for both furnaces, it offers an advantage in first cost over separate houses, and in case one elevator breaks down, the other may be used



GROUND PLAN AND GENERAL ARRANGEMENT.

1, Stock-house; 2 2, Casting-houses; 3, 3, Stacks; 4, Elevators; 5, 5, Ovens; 6, 6, Boilers; 7, Engine-house.

for both furnaces, which cannot be done where the two stacks are widely separated.

The arrangement of boilers and ovens gives great compactness without crowding, and has the shortest possible lengths of gas, blast, and steam pipes, thus reducing losses by friction and radiation. The air from the receiver is led into the coolest part of the ovens, and out at the hottest, which is, at the same time, the nearest end to the furnace. In the same way the water enters the boilers at their coolest part, and the steam leaves at the hottest part, which is also the nearest to the engines. The engine-house is removed to the most distant point from the stock and casting-houses, away from the dust, which might do injury to the engines. The ground sloping down from the engine-house to the canal permits all the buildings to be placed on different levels with advantage, without unusual expense for filling or excavation. The stock-house is the lowest of all the buildings; the bottom of the hearth of the furnace is five feet higher than this, and the bottom of the boilers and ovens is five feet above the level of the hearth. An arrangement for the rapid unloading and storing of coal or other material that may arrive by canal is provided, consisting of two elevated rails secured to the iron trusses of the roof of the stock-house, on which small wheels may run supporting chains which carry stock buckets. The rails run from the end of the transept at the canal wharf through the whole length of the stock-house, and return to the wharf, thus allowing the running on them of several suspended buckets at once, and insuring a very rapid, as well as cheap, method of handling. A light railroad track, of three feet gauge, is laid along the outside of the casting-house, between it and the boilers and ovens, one end extending to the iron piling and shipping ground alongside of a turn-out of the railroad, and the other to the slag dumping ground. Branches run from this road into the ends of the casting-house to receive the pig iron, and to the cinder tap of each furnace to receive the pig iron.

COST OF MANUFACTURE OF PIG IRON.

I.

Estimate of cost of manufacture of one ton of pig iron at the proposed works, assuming the use of one-half Ringwood, one-quarter Green Pond, and one-quarter Staten Island ores, with an average analysis of 59·22 per cent. of metallic iron.

		Delivered.
Ringwood and G. P. ores	1·20 tons at $5.00	$6.00
Staten Island ore	0·40 " " 3 50	1.40
Coal	1·30 " " 4.25	5·53
Limestone	0·30 " " 1.25	37
Labor		2.00
Interest on capital, $400,000 at 7 per cent., divided by 36,500 tons per year		77
Wear and tear of furnace, 10 per cent. on $260,000, divided by 36,500 tons per year		72
		$16.79

II.

Assuming the use of one-half Ringwood, one-quarter Wanaque, and one-quarter Staten Island ores, with an average analysis of 48·23 per cent. of metallic iron.

		Delivered.
Ringwood and Wanaque ores	1·50 tons at $4 00	$6.00
Staten Island ore	·50 " " 3 50	1.75
Coal	1·60 " " 4.25	6 80
Limestone	·70 " " 1.25	88
Labor		2.25
Interest on capital, $400,000 at 7 per cent., divided by 31,200 tons per year		90
Wear and tear of furnaces, 10 per cent. on $260,000, divided by 31,200 tons per year		84
		$19.42

NOVEL SUIT.—Mine Inspector T. M. WILLIAMS, of Wilkes-Barre, Pa., is the most efficient inspector in the coal regions, as the condition of the mines in his district abundantly testifies. Mr. WILLIAMS has recently instituted, in his official capacity, a suit against a miner, who neglected to properly timber his "working place," as directed by the foreman, his negligence resulting in a fall of roof which killed the laborer he had working for him. He has also instituted proceedings against a fire boss, at the Empire Shaft, for neglecting his duty, causing an explosion of fire-damp by which two men were severely injured. In the former case the offender was allowed to give bail in $2,000, to appear before the higher court, and the other gave bail in $300 to appear.

ABSTRACTS OF LECTURES ON MINING.—No. XIV.

By Prof. W. W. Smyth, M.A., F.R.S., Royal School of Mines, London.

(*From the London "Mining Journal."*)

IN the last lecture we examined some of the circumstances under which bore-holes were employed, and into some of those cases in which borings might, with advantage, be used more frequently than they are. In the present lecture we have to examine the operation of boring when it has become of a more difficult character than before. The ingenuity, great experience, and considerable outlay which are necessary to meet these difficulties have rendered this branch of engineering of such a character that those who have steadily practiced this kind of work for a great number of years will be far better guides than other engineers with a far greater amount of general education. If we look at a few of the most remarkable works of this kind, we have in this country the bore-holes now sinking at Battle, in Sussex, for scientific purposes, which has reached a depth of over 1,800 feet. Then there is the bore-hole for the well of Grenelle, in France, which was put down to a little over 1,800 feet, the sinking of this was watched with great interest by the French Institute, inasmuch as it was effected at a time when the whole matter of boring in connection with these deep wells was in a condition of uncertainty. Again, there are the deep bore-holes at St. Louis and Louisville, in America, and the one at Mondorff, in Westphalia, the latter being over 2,200 feet. That of Creusot, in France, was the first to exceed 3,000 feet, and was put down with the hopes of finding coal, inasmuch as it had been suggested from a consideration of the nature and position of the rocks in the locality that it was present underneath. This last was one of the cases I had in mind when I spoke previously of the careful and scientific way in which some of these continental borings have been carried out. A thermometer was let down at certain intervals after work had ceased, in order to ascertain the temperature of the rocks, and samples of the rocks passed through were carefully collected and preserved. One is only sorry to relate that such an undertaking was a failure, so far as its main object was concerned: the coal measures were pierced, but no coal found, and ultimately, from several causes of difficulty, the work was abandoned. Since that time a bore-hole deeper still has been sunk at Sperenberg, near Berlin, in a hill of gypsum; this had a diameter of 14 to 15 inches, and was successfully carried to a depth of 4,051 feet; it is the deepest hole yet made into the crust of the earth.

As the depth of the bore-hole increases a number of difficulties arise. There is the accumulating weight of the rods, and this with the iron rods referred to above, about 1 inch square, would amount to 1 ton for a depth of 100 fathoms: this weight of course, will be proportionally increased when you have, as at Sperenberg, the rods 1¼ inch square. When you get to a depth of 600 to 1,000 feet it is desirable to introduce some arrangement which will allow of steam power being employed to work the apparatus. Not only the weight of these long rods suggests a difficulty, but also the vibrations that are set up by the concussion; and these vibrations are injurious in two ways—firstly the effect they have in loosening the joints, and secondly by the fact that they tend to destroy, to a great extent, the cohesion of the fibers of even the best iron. Moreover, the striking of the vibrating rods against the sides of the bore-hole is apt to injure those sides, and thus to accumulate a mass of broken material above the tool; and this sometimes leads to rupture when it is attempted to withdraw the apparatus. Several methods have been proposed for obviating some of these difficulties, among others I may mention the patent of Mr. PATON, in Scotland. There may be a great deal of information on the subject to be obtained from the works of eminent borers, as, for example, that of Mr. KIND in German, and of DÉGOUSÉE and LOURENT in French. When the borings attain such great depth there are several means of raising the apparatus. One method is as follows—the rods may be suspended from the short arm of a lever in the form of a great beam, the longer arm of which is connected by a chain or rod of iron with a point near the middle of a second beam; one end of the latter is fixed, and the other is depressed at intervals by large teeth set on a windlass, turned either by manual power or by a steam-engine. A large framework, or shears, frequently one of the ordinary triangular form, is erected, and other windlasses are used for withdrawing the rods. In performing the latter operation the rods are raised to a certain height, and then a pair of nippers, or other similar arrangement, above the hole, holds them just under a joint, until the upper portion is unscrewed, or, if the rods are being put down, until another is screwed on. It will readily be understood that a great amount of time is spent in this screwing and unscrewing of the rods, especially if it be in small lengths. A saving of time in this item may be effected by employing longer rods; or, in another way, by having a tall frame (as much as 90 feet in the Prussian bore-hole), so that more than one can be unscrewed at a time. In districts where the seasons are severe it may be necessary to house this framework, etc., in, and thus a conspicuous object to the north of Paris is the wooden tower over the boring apparatus at La Chapelle. This bore-hole is of great interest in many respects, and especially for its size: it was commenced with a diameter of 6 feet, and when the lecturer last saw it, just before the great war, it was still 5 feet. Its object, like that of the well at Grenelle, is to sink to the water-bearing beds below the chalk.

When the rods, by means of the vibration, strike against the sides of a bore-hole, not only do they injure it, but the friction holds the rods back, and prevents the falling apparatus from acquiring the velocity which it otherwise would, and, therefore, from doing all the work which it ought to do. Hence, in a very early period in the history of these deep bore-holes it was suggested on the one hand to lighten the weight of the rods by some means, and on the other to liberate the cutting tool in some way from the great weight of the whole of the rods when making its blow. Among the first means suggested was that of using hollow instead of solid rods, and among those who worked most successfully in this department was VON ŒYNHAUSEN. He obtained very great success with the hollow rod in the boring carried out in Westphalia to a depth of 2,220 feet; the difference in the weight between solid rods and hollow ones would be, of course, very considerable. It was found that with them a greater number of strokes, as well as longer ones, could be made in a given time; and that in a certain kind of rock the mean rate of advance was 10¼ inches in 12 hours, when before it was only 7 or 8 inches. Another plan, adopted largely by the Americans, and to some extent by the Germans, is to use wooden instead of iron rods; these were floated up more or less by the water in the deep bore-holes, and thus a great part of the excessive weight was relieved, and a very satisfactory result was obtained. The rods were from 30 to 36 feet long, tapered

toward each extremity; a piece of wrought-iron was fixed to each end, by means of plates or bolts, in order to carry the screw by which the rods were screwed together.

The next suggestion was to relieve the boring tool of the inefficiency due to the friction and vibration of the rods attached above; letting fall only the boring tool, and so much of the other apparatus as is necessary to render it heavy enough to do its work. If then you have a boring tool sufficiently heavy, of course it will be desirable to raise it with an apparatus of the least possible weight. KIND, therefore, proposed that a very light upper rod should be employed for the purpose of raising the 30 or 40 feet of heavy rod attached to the cutting tool, but this cannot be carried out beyond a certain point; you cannot reduce the thickness of the rod below a certain size. A certain officer in the Prussian Engineers, and a mining official, of the name of FABIER, proposed a falling piece, which could be worked by being actually dropped from the remainder of the rods at a certain point, and could again be lifted by something in the shape of nippers. This has been called the free falling cutter. One form of this is constructed in the following manner: at the end of the main rod is a cylinder of much larger diameter, in the sides of which are four vertical slots, each with a small prolongation sideways at the top. The top of the tool is formed as a cross piece, the arms of which move freely in the slots, and will also lodge in the side prolongation of the slots. It is lifted up in the latter position to a height less than that of the slot, and then a small jerk of the rods by the master borer dislodges the tool, and it falls. It is lifted up again by lowering the cylinder, so that on turning it round it would catch the cross-pieces in the side slots (Fig. 16 shows roughly the principle, though not the proportions of the arrangement). Another method consists in having a pair of bent levers, hanging somewhat like pincers, which grasp the tool and raise it.

Fig. 16.

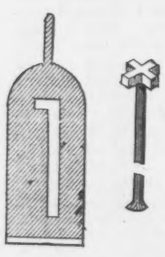
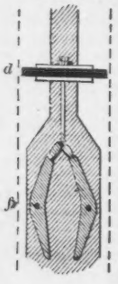


Fig. 17.



Movable on the upper part of the apparatus is a disk of leather, fitting closely round the bore-hole, so that when the instrument is being raised through the water, the effect is a pressure on the upper surface of the disk, which tends to depress it relatively to the rest. By means of a collar, a set of levers, or other structure connected with the disk, it acts upon the pincers so as to open them and release the tool. (The principle of one form of this arrangement is represented in Fig. 17, where *d* is the disk, and *f* the fixed point of the levers.) It may be objected that water is not always present to work these disks, but in these deep bore-holes it is rarely absent. So, partly to meet this objection, and partly to evade KIND'S patent, another instrument was introduced, in which the concussion from the blow given by the heavy beam of a steam-engine was made to release the cutter. This method so injured the bore-holes, the concussion being transmitted through the ground, that it was soon given up. Then a second and far more successful method was introduced by Dégousée which dispensed with the disk in KIND'S method. A heavy rod of iron, hanging down by the side of the cutter, and attached to a collar above, which would serve the same purpose as the disk in the water—*viz.*, act on the pincers which held them. With apparatus of this kind a great many strokes can be given in a minute, with great reliance and precision. The lecturer said he was much struck when he saw this last apparatus at work by the manner in which you could feel the release of the boring tool, even at the depth of 600 to 700 feet, and by the satisfactory manner in which the work was performed, so as to leave no donbt of its being an excellent plan. Occasionally small pieces are added in parts outside of the rods, for the purpose of guiding the tool, and these may carry additional cutters, to aid in keeping the bore-hole as true as possible, and to preserve it vertical throughout, the latter being a point of great importance.

The next consideration is to obtain satisfactory samples of the material cut through. The old plan of boring was to chip the whole up to pieces, even into slime, so that it was necessary to look very closely to see if a black spot was a piece of coal or not, and hence arose many mistakes. But a great improvement on this method was suggested long ago—that of putting down a cylindrical tool, and cutting away the rock round the circumference, so as to leave a central core. Then a second tool is employed, in which, by means of a string, a tooth is detached, which cuts away a great part of the foundation of this core, so as to weaken it. That is withdrawn, and a third tool introduced, with clamp worked by a spring or gravity, so as to catch hold of the core, which is then drawn away in a lump. Pieces may be very conveniently detached in this way 1 foot length, and are very important for several reasons. You may see accurately what kind of rock it is you are working in, and, as in the case of the scientific boring at Battle, you may bring up bodily some of the rock containing fossils, so that you can determine not only the texture and nature of the rock, but also to form some conclusion as to its geological position. A third advantage is that you may by this means frequently get a clue to the stratification of the rock, but very great precaution is necessary here; the rods must be drawn up steadily, and carefully watched, to see they do not alter their position. If the core brought up shows distinct lines of stratification, or if it shows the junction of the bed with one above or below, you will be able to come to some conclusion as to the direction of the dip and strike of the beds. And it is quite possible that information so obtained would help you to determine in what part you should sink your pit, so as to come on the seams. In the large bore-hole of La Chapelle cores of chalk have been brought up as much as 3 feet in diameter, and 5 to 6 feet long, and set round the workings as trophies. The lecturer advised any of his hearers who might happen to be in that neighborhood not to omit going to see these trophies of boring art.

THE HUNT & DOUGLAS COPPER PROCESS ABROAD.—We take the following extract from a letter by Mr. W. T. RICKARD, the well-known English mining engineer and metallurgist, addressed to one of his clients, a large proprietor of mines in this country:

"16 LEWISHAM ROAD, FOREST HILL, LONDON, ENGLAND, Sept. 27, 1876.

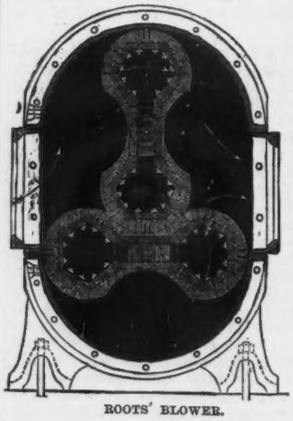
"MY DEAR SIR—I have just returned from Servia, and at last sit down to answer your kind note of May 10 from New York. . . . I shall be here for some little time to come, the Servian Copper Company having been compelled to close their works at Maidempek, until peace shall be re-established on something like a permanent basis. I have terminated my connection with them for the present, although they wish me to return and take charge of the establishment in the Spring, provided the state of the country will justify it. I am glad to say that I have been most successful in my treatment of their low grade copper ores (two per cent.), by means of the HUNT & DOUGLAS process of working, greatly facilitated by a new roasting furnace which I have introduced. . . . It roasts twenty tons per day, with a consumption of three or four cords of wood, and three men in a shift, being, to a great extent, automatic, and possessing all the advantages and rapidity of the Stetefeldt, without its drawbacks. It will condense arsenious and sulphurous acids, and being constructed chiefly of red brick, is very inexpensive, and can be run up in twenty or thirty days. By my system of working I brought the copper into a pure and marketable condition in three days after it was taken from the mine, at a cost of twelve shillings and sixpence per ton of ore, including mining, which, at Maidempek, does not exceed four shillings per ton. The Board was so well satisfied with the result of my efforts that they voted me a letter of thanks, as I had extricated them from a serious muddle in which they had been left by some incapable parties who had undertaken to deal with the low grade ores by the wet process, when the percentage of copper had fallen too low to pay for smelting. . . . (Signed) W. T. RICKARD."

BLOWING AND VENTILATING MACHINES AT THE PHILADELPHIA EXHIBITION.

Special Correspondence of the Engineering and Mining Journal.

THE ROOTS BLOWERS AND GAS EXHAUSTERS.

THE practical success in the working of rotary pressure blowers is due, in a great measure, to the many experiments and trials which the ROOTS BROTHERS have carried on in this direction for a considerable number of years. The difficulties which have been encountered in practical experience have been generally met by some modification in construction, so that the machines of the present day, although in principal like those first made, give decidedly different results with regard to their working performance. The gradually increasing demand for machines which will force air under considerable pressure and in constant quantity into large cupolas for melting iron, has not only had the effect of throwing out of use the hitherto commonly used fan or centrifugal blowers, but has called for much nicer fitting in the working parts of rotary pressure blowers. The extended use made of the ROOTS blower at the present time, proves that these improvements have been arrived at in their construction. The machine, of which a section is here shown, consists, essentially, of two figure 8 drums, which revolve together horizontally, and at the same level in a cylindrical shaped casing.



ROOTS' BLOWER.

The two drums are kept nearly in contact with each other all the time, and except when passing the suction or delivery pipes are also nearly in contact with the casing. Two shafts or arbors, supported on long outside bearings, run through this cylindrical casing, and to them are bolted the frames on which the drums are constructed. These frames are made of cast iron, and in section are like the finished drums. Over them is bolted a covering of wood which serves to form the exterior surface of the drums. Formerly this covering was made of well-dried hard woods oiled, but changes in the amount of moisture contained in the atmosphere, or in the gases being operated on, sometimes had the effect of swelling the drums so as to impede their action to a considerable degree. This difficulty has recently been entirely overcome by using soft white pine, prepared by impregnating its fiber thoroughly with boiling paraffine. The resulting wood is hard, moves with but little friction, and is not in the least affected by moisture. This non-changeability in form has made it possible to reduce the clearance between the working parts to about 1-100 of an inch.

Two adjustable packing strips, which are shown in section at the ends of the longer axis of the figure 8 drums, can be moved up or easily replaced in case of extraordinary wear. These points on the drums are more liable to injury than any other, owing to their being the ones which engage with the circular casings after having passed the suction and delivery holes. The successful working of the blower largely depends on the keeping of the two drums in their proper relative positions with reference to each other, for if this is not maintained it will readily be seen that the one drum will bind on the other in some places, while on others too great distance will exist between them. To insure this accurate working, two sets of carefully cut gear wheels are put on the ends of the drum shafts. Two equal sized pulleys, put on the opposite ends of the two shafts, are driven from a countershaft by an open and a crossed belt. This arrangement tends to prevent any unequal strain and consequent wear on the gear wheels. The journal boxes, in which the shafts run, are made with removable linings, so that they can be replaced without disturbing the shafts. The shafts are sometimes made of iron, but where long and heavy service is required steel is generally used. For certain uses, where continuous service is required, it has been found advisable to prolong these shafts beyond the pulleys, and make outside bearings.

In places where the horizontal width of the cylindrical casing is too great for the required space, the machines are constructed so that the two drums are placed vertically in line with each other, an arrangement not specially desirable. With regard to the delivery of air, it will be seen that at each revolution of the drums four distinct volumes of air are discharged which, coming directly into the ordinary delivery pipes, produces a slight pulsation in the blast pressure. This is, however, very slight, and in cupola practice works advantageously, loosening the charges in their descent by its percussive action. If it were necessary to avoid this pulsation entirely, the interposition of a receiver, such as is used on large cylinder blowing engines, could be used.

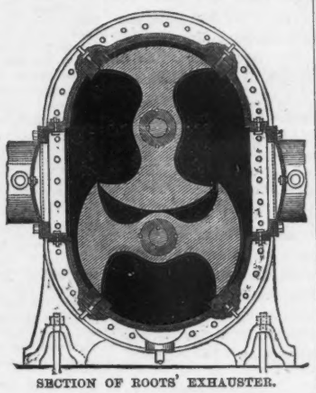
The purposes to which these blowers have been applied are varied. Primarily they are used for furnishing blast to iron melting cupolas in foundries and Bessemer works. Their use for the latter purpose has been quite extensive in England and on the Continent.

For exhausting, they have been used in a number of industrial establishments to produce ventilation, or to draw off noxious fumes or grinder's dust. The pneumatic system of transmitting dispatches, used in the New York office of the Western Union Telegraph Company, is operated through the agency of a ROOTS' Blower.

In the exhibit of ROOTS BROS. at the Exhibition, which is located in the Pump

Annex to Machinery Hall, there are several blowers of different size. One of these, called a No. 4 Machine, has been run with small discharge areas, so that the pressure of air amounted to 8 inches of mercury. It is hardly necessary to say that air at such a pressure cannot profitably be forced by this or similar machines, owing to the great back leakage which would take place. One of the blowers, which are shown in this exhibit, is driven by a HASKIN'S direct-acting vertical engine, which, with the blower, is bolted to a continuous bed-plate. This method of driving blowers is sometimes a very desirable one, and gets rid of all belting, counter-shafting, etc., which are necessary when pulleys are used.

When it is necessary to exhaust, or force hot gases, the pressure blowers, just described, will not answer, owing to their action on the wooden linings to the drums, and also, on account of the fouling which would take place on the interior of the casings, by tar and other mechanical impurities, which the gases generally contain. The gas exhauster made by ROOTS BROS. has the wood-lined pistons replaced by metal ones, the form of them being somewhat changed, as will be seen from the section. Then, too, the drums, instead of bearing against the inside of the cylindrical casing clear it by an inch or more. Some thin metallic strips are set in the casing on each side of the inlet and outlet holes, and which, by exterior adjusting screws are brought up, so that the drums will just clear them as they revolve. Any wear which takes place in the drums is easily taken up by these adjustable strips. The form which is given to the drums is made necessary, in order to provide for the removal of the tar which condenses on them. By this arrangement about three per cent. of the gas which is condensed at each revolution, is inclosed between the drums, and carried back into the inlet space. The difficulties resulting from the leakage of tar into the gears and journal-boxes from the interior of the exhauster, through the holes made in the head-plates for the shafts, has been remedied by providing them with stuffing-boxes.



SECTION OF ROOTS' EXHAUSTER.

The journal-boxes are made long, and are set so as to be readily accessible and easily watched. As it is generally most convenient to put the exhausters where the gas can flow along through a horizontal main, they are made with the two drums placed vertically in line with each other, and, consequently, having the entrance and discharge pipes at the opposite sides of the casing. In the exhibit of ROOTS BROS., three of these exhausters are displayed. The largest of them is a No. 6 machine, which discharges 25 cubic feet at each revolution, and which can be run at 60 revolutions per minute. Another of the machines exhibited is a No. 3 Exhauster, which is driven by a directly connected HASKIN'S Vertical Engine. This exhauster discharges 5¼ cubic feet per revolution, and can be run at 90 revolutions per minute. Inclosed in the same exhibit are a number of blacksmiths' forges, fitted with small pressure blowers, which are, essentially, like the one already described.

Considering the exhibit of Messrs. ROOTS, as a whole, thoroughness in construction, and simplicity and convenience in design, are characteristic of all these machines. The only particular in which difficulty is likely to occur in their use, that of the binding of the two revolving drums together, through imperfections or wear in the gears, is provided against by using carefully cut gearing. This gearing is protected from the cutting action of dust or other gritty materials, by suitable coverings, and they are relieved from nearly all the strains produced in working the blower, by having each shaft driven by independent pulleys.

The practical tests to which many of these machines have been put, by years of use, have demonstrated their general efficiency.

INTERNATIONAL EXHIBITION OF 1876.

Special Report of the Engineering and Mining Journal.

ADMISSIONS FOR THE WEEK ENDING OCTOBER 16, 1876.

Date.		Paying Visitors.	Press, Complimentary, and Exhibitors.	Total Visitors.
Previously reported.....	.....	5,304,872	1,383,261	6,688,133
October 10.....	132d Day..	79,888	12,091	91,979
" 11.....	133d " ..	94,331	12,616	106,947
" 12.....	134th " ..	101,811	13,881	115,692
" 13.....	135th " ..	81,926	12,338	94,264
" 14.....	136th " ..	78,278	12,593	90,871
" 16.....	137th " ..	74,657	12,871	87,528
Totals.....		5,815,763	1,459,651	7,275,414

MINING NOTES FROM CALIFORNIA, COLORADO, NEVADA, AND UTAH.

CALIFORNIA.—*The Crown Point Gold Mining Company* has lately been incorporated with 60,000 shares of a par value of $1 each. This mine is located in Drytown, Amador County. The croppings of the ledge are very heavy, and can be traced for 800 feet, averaging about 8 feet in width, all said to be gold bearing. The development at present consists of a shaft 70 feet deep, the width of the ore averaging 6 feet. Two crushings of the rock have been had, one comprising 73 tons, yielding $10 per ton, the other giving $10.50. Ground is now being graded for the erection of a ten-stamp mill, which will be pushed to completion as early as possible. It is contemplated to get the water to run the mill from the Gover Mine, thereby insuring an almost uninterrupted supply. Another quartz discovery has lately been made in the neighborhood, which has been christened the Exchange Mine. The ledge describes an acute angle with that of the Crown Point, running in a south-easterly direction. The rock, we are told, will yield something like $20 per ton.—*Amador Ledger*, Sept. 30.

LITTLE ANNIE MINE, RIO GRANDE COUNTY, COLORADO—OCTOBER 2, 1876.—We have been informed by our Special Correspondent of the following interesting discovery: "It may interest you to learn that the richest pay-streak, or pocket, ever found in this district, if not in Colorado, was struck in the Little Annie Mine, on Friday, 29th ult. A specimen in the company's office, weighing fifty-four pounds, is, in considerable proportion of its bulk, metallic gold. Smaller pieces, weighing from two to ten pounds and more, show the richest and most solid inlaying of ore that the writer has ever seen. There are 6100 pounds of the rock in my room that I would judge contain from $600 to $900. If they are exponents of the true inwardness of South Mountain, the latter will, in a short time, be as well and widely known as Mount Davidson. The rich streak, so far as explored, appears to be continuous, and to 'strike' toward the Margaretta. The latter lode has, for three weeks previous to this discovery, yielded the richest gold rock ever milled here. It was struck on the 26th of August. R."

NEVADA.—*Baltimore Consolidated Gold and Silver Mining Company.*—The annual meeting of this company was held in San Francisco on the 5th inst., at which the Superintendent submitted the following report:—The lowest level prospected at the time of my last report was the 800-feet level, upon which there has been nothing done during the past year except repairing and retimbering the drifts. The incline at that time was 116 feet deep; its present depth is 1,016 feet, making a total of 900 feet sunk during the past year. At a depth of 356 feet in the incline, or at a perpendicular depth of 1,050 feet from the surface, the first incline station was opened. At every perpendicular hundred feet below this level a station has been put in, making in all five stations. The greatest part of the prospecting done during the year has been on the 1,050-feet level, although drifts have been run from the 1,250 and 1,450-feet levels. At each of the stations from which drifts have been run a ten-inch plunger pump has been put in, which keeps the mine perfectly free from water. On the 1,050-feet level we have run a number of drifts and cross-cuts, and the ground passed through so far shows many favorable prospects, the fissure or lead formation being very wide, and showing very strong indications On the 1,250-feet level there has been but one drift run, therefore this level is entirely unprospected. The station at the 1,450-feet level was not completed until the early part of September, which made it nearly the middle of the month before the drift was started. This drift has made good progress, and will soon reach the ledge formation. Beside the 900 feet of incline sunk during the year, we have run on the different levels an aggregate of 3,100 feet of drifts, have opened the 1,050, 1,250, and 1,450-feet levels at each of which there has been a tank put in and also a plunger pump; there have also been stations opened at the 1,150 and 1,350-feet levels but no other work done at these levels. The fine and powerful machinery, completed just prior to my last report, is in fine order, and has an air compressor added to it during the past year. In conclusion I would say, I have sufficient encouragement on the 1,050-feet level running north to warrant thorough and vigorous prospecting, and hope within a few days to be able to uncover some ore, which I trust will lead to a permanent body. The drift running south in this level is also looking favorable, and shall, in a few days, commence cross-cutting in this drift. —*Stock Report*, October 6th.

This mine is on the Comstock Lode, and is represented by a capital of 84,000 shares. We note recent quotations on the San Francisco Stock Market ranging from $2 to $3 per share. The company has received about $162,000 from assessments during the year, in addition to loans aggregating $60,000 more. The average monthly expenses for developing the mine have been about $17,000.

Richmond Consolidated Silver Mine.—This company is troubled with too much ore. It is capable of producing three hundred tons of ore a day, if the furnaces could reduce that quantity; but as that quantity is beyond the smelting capacity of the furnaces, the ore has accumulated until it has come to be a sort of a welcome nuisance. The mine and dumps are full to overflowing, and the company has been obliged to discharge a number of miners on this account, and the mine will be shut down during to-day in order to give the teams a chance to reduce the dumps.—*Eureka Sentinel*, Oct. 8.

We note recent quotations of this stock on the London market, where it is principally held, at 9¾@10¼. The stock of the company consists of 54,000 shares, on which £5 has been paid.

Eberhardt and Aurora Silver Mine.—The tunnel in this mine is completed to a distance of two hundred feet, two shifts of men being employed. When the machinery and drills are set in motion, it is thought that not less than from five to seven feet of tunnel will be made every twenty-four hours. We are informed that very favorable indications for veins of ore have already been struck in the tunnel, in the way of a number of feeders that probably attach to some vein. The company is also sinking an incline shaft, which has now attained a depth of 842 feet, and the indications are said to be very encouraging for striking ore. It is doing a large amount of dead work, and are employing more men than at any time within the last three years, The company, during its last run of thirty-six days, turned out bullion amounting to $110,000. We presume that considerably more than one-half of this amount is clear profit. During this run there were 200 tons of the lowest grade ore put through the mill.—*White Pine News*, Oct. 7.

The stock of this company consists of 23,500 shares, £10 paid, and is held in London. The closing bid price on the London Stock Exchange on the 3d inst. was £8 15/.

UTAH.—*The Wendigo Silver Mine* is located in Diamond City, in the Tintic District. This mine produces a peculiar, soft, mixed ore, which needs water dressing before being shipped. It cleanses rapidly and easily, leaving a residue carrying from 60 to 200 ounces of silver per ton, 30 per cent. lead, 20 per cent. copper, considerable zinc, etc. At the 200-feet level is found some high grade arsenical ores, assaying away up in silver. At the 300-feet level an iron dyke has been struck, the ore from which assays from $49 silver to $113 silver, and $30 gold. Occasional small pipes and seams in the mine will assay from $500 to $2,000 per ton.—*Salt Lake Tribune*, Sept. 30.

Baldy Fritz Silver Mine.—A new and extensive strike has been made in this mine, which is located in the Little Cottonwood District. The vein is reported ten feet wide, and the ore rich in silver and lead.

NOTES.

MINE INSPECTOR APPOINTED.—WM. S. JONES, Esq., has been appointed Inspector of Mines for the Scranton District, Pa., in the place of PATRICK BLEWITT, who has resigned.

CAMBRIA IRON COMPANY.—Since the last reduction of thirteen per cent. in the wages, the laborers of this company at Johnstown, Pa., are said to receive only seventy cents a day.

PHŒNIX IRON COMPANY MILL.—It is rumored that a portion of the new mill of the Phœnixville Iron Company, of Phœnixville, Pa., will be turned into a nail mill and the remainder into a wire mill.

EXODUS OF MINERS FROM THE ANTHRACITE REGIONS.—Large numbers of miners have left the Wyoming Valley and other parts of the Anthracite regions for the Territories. Since the rupture of the Coal Combination, though wages have been reduced, work has been steadier and the men are better off than they were before.

COKING ANTHRACITE CULM.—Experiments have been commenced at the Cambria Iron Works, Johnstown, Pa., under the direction of F. PLATT, Esq., of the Pennsylvania Geological Survey, to test the possibility of coking, as they do in Wales, the following mixture:

Anthracite culm or slack.....	60 per cent.
Bituminous coal (Latrobe).....	35 "
Pitch.....	5 "

The test will be made in the Belgian ovens of the Cambria Iron Company.

STATISTICS OF COAL PRODUCTION.

This is the only Report published that gives full and accurate returns of the production of our Anthracite mines.

Comparative Statement for the week ending Oct. 14.

Tons of 2,240 lb.	1876.		1875.	
	Week.	Year.*	Week.	Year.*
Wyoming Region.				
D. and H. Canal Co.	52,231	1,471,495	36,669	2,398,863
D. L. and W. RR. Co.	65,992	1,311,230	49,116	2,403,815
Penn. Coal Co	27,301	793,501	32,163	1,072,700
L. V. RR. Co.	18,492	742,397	15 714	739,009
P. and N. Y. RR. Co.	—	17,488	1,085	80,978
C. RR. of N. J.	44,704	993,784	53,549	1,043 019
Penn. Canal	12,166	315,417	12,208	224,936
	220,946	5,645,312	200,504	7,963,320
Lehigh Region.				
L. V. RR. Co	87,075	2,001,133	94,042	1,471,228
C. RR. of N. J.	41,384	1,042,790	38,913	500,660
D. H. and W. B. RR.	2,220	32,324	1,916	63,581
	130,679	3,076,247	134,876	2,035,469
Schuylkill Region.				
P. and R. R. RR. Co.	170 935	3,498,196	177,004	3,437,601
Shamokin & Lykens Val.	29,475	667,748	28,831	966,714
	200,410	4,166,244	205,835	4,404,315
Sullivan Region.				
S ll. and Erie RR. Co.	—	27,663	285	6,492
Total	552,035	12,915,466	541,500	14,409,596
Increase	10,535	—	—	—
Decrease	—	1,494,130	—	—

* Year beginning January 1st.

The above table does not include the amount of coal consumed and sold at the mines, which is about five per cent. of the whole production.

The decrease of shipments of Cumberland Coal over the Cumberland Branch, and Cumberland and Piedmont Railroads amounts to 455.543 tons, as compared with the corresponding period in 1875.

Belvedere Delaware RR. report.	Week.	Year 1876.	Year 1875.
Receipts of coal at Coal Port (Trenton)	10,341	214,685	132,235
" " " South Amboy	8,118	341,050	190,125
Shipments at Coal Port (Trenton)	9,693	211,879	128,118
" South Amboy	13,600	374,242	254,781

Perth Amboy business: Tons.

Received for the week	16,607
Shipped for the week	27,988
On hand Oct. 14	57,738

Coal Shipped at Picton, N. S., for week ending Oct.

14 1876	6,143 tons.
Previously exported, since Jan. 1	140,938 "
Total to date	147,081

The Production of Bituminous Coal for the week ending Oct. 14, was as follows:

Tons of 2,000 lb., except where otherwise designated.

Cumberland Region, Md.	Week, Tons.	Year, Tons.
Tons of 2,240 lb	41,689	1,407,734
Barclay Region, Pa.		
Barclay RR., tons of 2240 lb	7,774	263,235
Broad Top Region, Pa.		
Huntingdon and Broad Top RR	2,909	121,131
*East Broad Top	922	52,974
Clearfield Region, Pa.		
*Snow Shoe	973	40,297
*Tyrone and Clearfield	17,899	884,762
Allegheny Region, Pa.		
*Pennsylvania RR	3,284	160,431
Pittsburgh Region, Pa.		
*West Penn. RR	3,739	156,383
*Southwest Penn. RR	902	44,751
*Penn. & Westmoreland gas coal, Pa. RR.	21,117	641,014
*Pennsylvania RR	9,243	230,714

* For the week ending Oct. 7.

The Production of Coke for the week ending Oct. 7.

Tons of 2000 lb.	Week.	Year.
West Penn. RR	931	36,751
Southwest Penn. RR	9,812	403,104
Penn. & Westmoreland Region, Penn. RR.	1,655	41,587
Pittsburgh, Penn. RR	1,747	123,692
Total	14,145	6 5,134

COAL TRADE REVIEW.

NEW YORK, FRIDAY EVENING, Oct. 20, 1876

Anthracite.

THERE appears to have been a little more business since our last, although chestnut and stove sizes occupy the greatest attention. This is undoubtedly the result of the cold weather which ruled last week and early this week.

The Delaware, Lackawanna and Western Railroad Company will sell at auction on the 25th inst. 100,000 tons of coal, and the Delaware and Hudson Canal Company an equal quantity on the day following.

The following are the quantities of coal sold by the Pennsylvania Coal Company to-day, and the approximate average prices realized:

	Tons.	Prices.
Lump, Steamer, Grate	45,000	$2 92½ / 2 95 / 2 94
Egg	9,000	3 10
Stove	40,000	3 86
Chestnut	6,000	3 76
	100 000	

The above prices, as compared with the same company's sales of a month ago, show an advance of about ¼c. per ton on lump, 1½c. on steamer, 2c. on grate; a decline of 2¼c. on egg, and an advance of 22c. on stove and 56c. on chestnut. Making an allowance of 15c. per ton in freights, in favor of the Delaware and Hudson Canal Company, the prices realized to-day show a decline as compared with the Delaware and Hudson Canal Company's sales of the 28th ult. of 3c. on steamer, 11c. on grate, 4c. on egg, and 9c. on stove. Only 6,000 tons of chestnut coal were offered for sale to-day, and the price was run up and 5,000 tons taken by one party at $3.75 per ton, after which, at a great effort, the balance was disposed of at a slight advance over this figure. The bidding throughout the sale was not so spirited as at the previous sale.

The production of anthracite coal last week was 552,035 tons as against 508,972 tons for the week previous and 541,500 tons for the corresponding week of 1875. The decrease in production since January 1st as compared with the corresponding period of 1875 has been 1,494,130 tons.

During the week a rumor reached Wall Street that a new combination was forming, which, coupled with a general upward tendency given to the whole market by the prospects of war in Europe, caused quite an advance in the coal stocks. Rumors have, from time to time, been circulated, ever since the Combination broke, that strong efforts were being made to reorganize that body upon the basis of controlling only the production. From a thorough review of the situation we are led to believe that no progress has been made in this direction, though undoubtedly several of the companies would gladly revive the Combination. Precisely the same difficulty to a reconstruction exists to-day as that which ruptured the board of the late association.

If any agreement were to be proposed it would have to be of phosphor-bronze, so to say, for a cast-iron one would not be strong enough to satisfy some par ies and large deposits would have to be made subject to forfeiture in case of non-compliance with the terms of the agreement. After a number of meetings, and weeks of study, the committee presented a programme for the regulation of the late Combination. This contained penalties and all that should have been necessary to have controlled a body of honorable gentlemen, but still no penalties were paid, and the agreement was disregarded. The great lesson that the companies learned was to distrust each other, and the same distrust will always interfere with the reorganization of another combination. The strongest advocates of combination are those who appear to be driven to it in their efforts to tide over some temporary difficul y.

In short, the companies see clearly enough the advantages which would accrue to them for the moment, at least, from combination, but the causes which wrecked the last, and twenty other coal combinations before it, are and always will continue in force. The fact is, each company wants all the others to combine to restrict production and increase prices, while it practically stands outside the coalition, profiting by it, but free from any of its embarrassing restrictions. A renewal of the Coal Combination is impracticable and totally undesirable. While it, unquestionably, was of benefit during the panic of 1873 and the early part of 1874, in maintaining too high prices for coal during the past year or two it not only planted the seeds of its own dissolution, but it proved a positive obs ruction to that settling down in values which was and is an essential preliminary to a solid and permanent revival of business prosperity.

The coal companies are having sore trials, and we are sorry for it, but their ills are not to be cured by any renewal of combination, and any attempt to reimpose high prices for coal (the only apparent object of combination) would, eventually, and not very remotely, lead to the utter destruction of industries which must be looked to as the real sources of ultimate prosperity in the coal trade itself. The coal companies are reaching—by abrupt and rugged paths, it is true—that lower plane of values which has already been attained after a similar "shrinkage" in most of our other industrial enterprises, and the fact that the evil day was postponed for a time by combination, in nowise rendered the ultimate shrinkage less imperative.

Bituminous.

There can be but very little said about this interest. The Cumberland Region shows a loss of production for last week, as compared with the corresponding week of 1875, of 11,588 tons, and from January 1st, as compared with the corresponding period of last year, of 555,543 tons. The Clearfield Region shows a large falling off in production as compared with that which ruled during the Summer months.

Wholesale Prices of Anthracite Coal for Oct., f.o.b. at the Tide Water Shipping Ports per ton of 2240 lb.

	Lump.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
Wyoming Coals.						
‡Lackawanna and Scranton at Hoboken and Rondout	3 25	3 30	3 40	3 50	4 25	3 75
Pittston at Newburg	3 10	3 10	3 25	3 35	4 10	3 60
Wilkesbarre at Port Johnston	3 25	3 25	3 50	3 50	4 25	3 50
Plymouth, R. A.	....	....	3 50	3 50	4 30	3 50
Susque. Coal Co. at Amboy W.A.	3 25	3 25	3 50	3 50	4 00	3 30
Kingston at Hoboken	3 25	3 25	3 40	3 50	4 25	3 50
Lehigh Coals.						
Old Company at Port Johnston	4 00	....	3 60	3 60	4 00	3 30
Old Company's Room Run "	4 00	....	3 60	3 60	4 00	3 30
Sugar Loaf, Hobok. & Amb. "	4 00	....	3 60	3 60	4 00	3 30
Lehigh Coal Exchange "	4 00	....	3 60	3 60	4 00	3 30
Honey Brook Lehigh	4 00	....	3 60	3 60	4 00	3 30
Beaver Meadow at South Amboy	4 00	....	3 60	3 60	4 00	3 30
Schuylkill Coals at Philadelphia.						
Schuylkill white ash	3 20	3 20	3 20	3 20	3 70	3 20
Schuylkill red ash	...	....	....	3 30	3 80	3 20
Lorberry	....	....	4 20	4 20	4 20	3 25
Lykens Valley	....	....	4 70	4 70	4 70	3 70
North Franklin red ash	....	....	4 20	4 20	4 20	3 25

‡ Boats towed by the D. & H. . Co. at its expense to and from New York harbor.

Per ton.

Freight from Hoboken and Weehawken to New York.... 45c.
" " Elizabethport & Port Johnston to N. York. 45c.
" " South Amboy to New York.... 45c.

Freight by the boats of the companies from Hoboken, Port Johnston, Weehawken, Rondout, South Amboy and Perth Amboy to New York City and vicinity 50c.

Freight by the Pennsylvania Coal Company's boats from Newburg to New York 65c.

Lackawanna coal delivered to carts in New York or Brooklyn, 50 cents per ton additional.

Wholesale Prices of Bituminous Coal.

Domestic Gas Coals.

Per ton of 2240 lb.	At the Shipping Ports.	Alongside in New York.
Westmoreland and Penn. at Greenwich, Philadelphia	$4 70	$6 00
" " at S. Amboy	5 50	6 00
Red Bank Cannel Pa. at Philadelphia	8 00	8 50
" " South Amboy	8 50	....
" Orrel	6 00	6 50
Youghiogheny, Waverly Co., at Balt	4 25	5 65
Despard, West Va.	4 50	6 0
Murphy Run, West Va., at Baltimore	4 50	5 85
Fairmount, West Va., " "	4 40	5 70
Newburgh Orrel, Md. " "	4 50	6 00
Cannelton Cannel, W. Va.	....	10 00
" Splint, " at Richmond.	5 50	7 00
" Gas Coal at Richmond.	4 15	5 65
Peytona Cannel W. Va at Richmond	....	10 00

Manufacturing and Steam Coals.

Cumberland at Georgetown and Alexandria, Va.	3 50@3 75	4 90
Cumberland, at Baltimore	3 65@3 80	5 10
Clearfield f.o.b. Canton, Baltimore	3 40@3 65	5 25

Pennsylvania Semi-Bituminous Coalz.

At the mines, per 2,000 lb., 90c. f.o.b, at Greenwich, Phila., for Eastern and Foreign shipments, per 2,240 lb. $3 20@3 40 for Sound ports, 3 50@3 65, through Delaware and Raritan Canal, for points on Hudson River, $3 80 f.o.b., at South Amboy, N.J., per 2,240 lb., $4 50@4 70. Discharged, in New York, per 2,240 lb., $5 00@5 25.

Foreign Gas Coals.

	Sterling.	Am. cur'cy.
Newcastle, at Newcastle-on-Tyne	9/6@11/	6 50@ 7 00
Liverpool House Orrel, at Liverpool	26/	13 00
Ince Hall Cannel "	42/	18 00
" Gas Cannel "	28/	13@14
Scotch Gas Cannel, at Glasgow, nominal,	25/	7 50
	Gold.	
Block House, at Cow Bay, N. S	2 00	4 75
Caledonia, at Port Caledonia	1 50	4 25
Glace Bay, at Glace Bay	1 50	4 25
Lingan, at Lingan Bay	1 75	....
Sydney, International and Reserve mines, at Sydney	2 00	5 50
Pictou, Albion & Vale mines, at Pictou.	2 25	5 75

Retail Prices in New York.

Anthracite.

Per 2000 lb.	Grate and Egg.	Stove.	Chestnut.
Pittston coal, in yard	$4 20	$4 50	$3 80
Lackawanna coal, in yard	4 20	4 50	3 80
Wilkes-Barre, delivered	5 00	5 30	4 60
Lehigh & Locust Mountain, del'd	5 50	5 50	5 00
Schuylkill Red Ash, del'd	6 00	6 00	5 50

The Cost of delivery for Pittston and Lackawanna coal ranges from 40 cts. to $1 10 per ton, according to distance from the yard.

Bituminous.

Liverpool House Orrel, delivered, per ton of 2000 lb	$18 00
Liverpool House Cannel " " "	22 00
American " " "	13 00
Cannelton Block, or splint, " " "	10 00
American Orrel " " "	11@14
Red Bank Cannel " " "	10 00
Cumberland " " "	7 00

Baltimore, Md. Oct. 16, 1876.

Reported by our Special Correspondent.

ANTHRACITE.

Wholesale or Trade Prices per 2240 lb.

Wilkes-Barre "Lee" or "Diamond," Pittston and Plymouth. White ash.	In cars at depot.	By boats afloat.
Lump and steamboat	$3 85	$3 55
Broken	3 85	3 55
Egg	3 85	3 55
Stove	4 15	4 05
Nut	3 85	3 55

Shamokin, (red or white ash), and "Boston," free burning white ash,

Egg	4 10	3 80
Stove	4 35	4 05

Lykens Valley, red ash,

Egg and stove	5 35	5 05

From wharf or yard, wholesale, 50@75c. additional.
By retail, all kinds and sizes, per 2240 lb. ..... $7 00@7 50

BITUMINOUS.

George's Creek, Cumberland f. o. b. at Locust Point	3 75@4 00
West Virginia Gas f. o. b. at Locust Point	4 50
Youghiogheny Gas, f. o. b. at Locust Point	4 50
Swanton	4 00

Boston. Oct. 14, 1876.

COAL is in good demand, with prices on both cargo and car lots stiff. The receipts are rather light, the difficulty of obtaining vessels being again notable. The stock held here for the uses of the interior consumers is very light, probably not over 11,000 tons, and, should navigation close as early as is customary, it is thought that our supply for manufactures will be short enough to warrant an advance of $1 per ton.

The stocks at shipping points move off rather slowly, owing to the want of freight. Another auction of probably 100,000 tons each will be announced by the four great companies to occur the latter days of this month.

BITUMINOUS continues to sell in a steady way, with sustained prices. The stocks held here are light.

FREIGHTS are strong and buoyant at $1 50 from New York; $2@2.10 from Philadelphia; $1.45@1.50 from Baltimore, and $1.60 from Georgetown.—*Commercial Bulletin.*

Buffalo, N. Y. Oct. 15, 1876.

Reported by LEE & LOOMIS.

Deliv'red at	Elmira.	Ithaca.	Syracuse	Rochester.		Oswego
	Afloat.	Afloat.	Afloat.	afloat	ret. del.	f.o.b.
Grate	$3 80	$3 05	$3 20	$3 90	$5 15	$4 15
Egg	3 80	3 15	3 30	4 05	5 25	4 25
Stove	4 20	3 65	3 80	4 50	5 75	4 75
Nut	3 95	3 40	3 55	4 25	5 50	4 50

Delivered at	Erie.	Buffalo.			
	f.o.b.	Afloat.	f.o.b.	ret.	del.
Grate	$4 65	$4 15	$4 65	$5	40
Egg	4 75	4 25	4 75	5	50
Stove	5 25	4 75	5 25	6	00
Nut	5 00	4 50	5 00	5	75

Cleveland, O. Oct. 16, 1876.

Specially reported by Messrs. LAMBIE & BATES.

Per ton of 2000 lb. f. o. b. vessels.

WHOLESALE.

	For vessels,	On cars.
Youghiogheny Gas Coal	$4 10	$4 00
Cannel	4 25	4 15
Blossburgh	$5 00	$5 00
Briar Hill, Block Coal	3 50	3 25
Straitsville Coal Co., lower vein	2 90	2 90
" " " whole "	2 80	2 80
Hocking Valley	2 90	2 90
Massillon	2 90	3 00
Tuscarawas Valley	2 50	2 50
Columbiana	2 50	2 50

CLEVELAND COAL EXCHANGE PRICES UNTIL FURTHER NOTICE.

	1 to 10 tons.	10 tons upw'd.
Brier Hill lump	$4 25	$4 00
" " nut	3 75	3 50
Massillon and Mineral Ridge lump	4 00	3 75
" " " " nut	3 75	3 50
Straitsville Lower Vein, Hocking & Shawnee, l'p.	3 60	3 35
" " " " nut	3 40	3 15
Del Carbo lump	3 75	3 50
" " nut	3 50	3 25
Rich Hill lump	3 60	3 35
" " nut	3 25	3 00
Maple Hill lump	3 50	3 25
" " nut	3 25	3 00
Columbiana, lump	3 25	3 00
" nut	2 75	2 50
Lacka'a., Wilkesbarre and Pittston egg and grate,	6 25	6 05
" " " stove	6 75	6 50
" " " chestnut	6 50	6 25

Lehigh to be $1 25 per ton higher.
All sales to be strictly cash with order or C. O. D.

Louisville, Ky. Oct. 16, 1876.

Specially reported by Messrs. BYRNE & SPEED.

There is a large supply of coal here. The wholesale sales are light, taking into consideration the low prices. The retail demand is good.

Please report our prices as follows:

WHOLESALE.

	per bushel		per bushel
Pittsburg	6½c.	Pine Hill	—
Raymond City	6½c.	Kentucky	7c.

RETAIL.

	per bushel		per bushel
Pittsburgh	10c.	Peytona Cannel	18c.
Raymond City	10c.	Buckeye "	
Pine Hill	13c.	City-made Coke	8c.
Kentucky	9c.	Anth., per ton, $10 00 to 10 50	

Screened Pittsburgh per load	$3 50
Screened Raymond City	2 50
Pine Hill (Kentucky)	2 25
Canpel	4 50
City-made Coke	4 00

Milwaukee, Wis. Oct. 16, 1876.

Specially reported by Messrs. R. P. ELMORE & Co.

Trade is quiet. Our prices for coal are:

Retail price per ton of 2000 lb.

Lehigh Lump	$ 9 00	Briar Hill, select	$7 00
Lehigh Prepared	9 50	Blossburgh	7 00
Lackawanna (all sizes)	8 50	Cannel	8 00
Pittston	8 50	Pittsburgh	6 50
Scranton	8 50	Steam coal	5 50

New Orleans, La. Oct. 12, 1876.

Reported by C. A. MILTENBERGER & Co.

Pittsburg coal, wholesale, by boat-load, per bbl.	27@28c.
" steamboats, per bbl.	40c.
" to manufacturers	45c.
" shipments, per hhd.	$5 25
Anthracite, wholesale, per ton	8@8.50
" retail, "	12@13
Virginia Cannel, per bbl.	80c.
Scotch " "	80c.
Mt. Carbon, wholesale, per bbl.	...
" retail, "	50c.
St. Bernard wholesale, per bbl	250.
" steamboat	350.
" retail, "	450.

Pittston, Pa. Oct. 16, 1876.

Pennsylvania Coal Company's Coal in yard, ton of 2000 lb.

Retail.

Lump, Egg and Stove	$2 25
Chestnut	2 00

Delivered, fifty cents per ton additional.

Richmond, Va. Oct. 16, 1876.

Specially reported by S. H. HAWES, Dealer in Coal.

Prices are now as follows:

Per ton of 2240 lb., f.o.b.

Kanawha Cannel	$9 00	New River Bituminous,	$4 00
" semi-Cannel	4 00	Clover Hill Coal	3 50
Coalburgh Splint	4 00	James River Bitum	3 30
Lewiston "	4 00	" " Carbonite,	5 00
Kanawha Gas coal	3 90		

San Francisco, Cal.

From the *Commercial Herald*, Oct. 12, 1876.

Imports from Jan. 1st to Oct. 1:

	tons.		tons.
Anthracite	10,346	Vancouver Island	76,747
Australian	94,645	Rocky Mountain	152
Coos Bay	29,636	Seattle	69,064
Cumberland	9,251	Bellingham Bay	16,395
English	58,009	Chili	2,076
Mt. Diablo	86,408		

We remark a greater disposition to buy Scotch and English Steam cargoes, to arrive at the very low prices recently ruling, owing to the diminished production of the California Mount Diablo, and other coast mines, and the fear that some of those mines will be forced to cease operations entirely The Contra Costa *Gazette* of the 7th instant gives a gloomy prospect: "The Black Diamond and other coal mining companies owning and operating the mines at Nortonville and Somersville have notified the employés that they will be obliged to discontinue work and close the mines, unless the workmen will consent to a reduction of twenty-five per cent. on rate of wages heretofore paid. The miners of the two camps have held several consultations upon the proposition, and while, in view of the large stocks of foreign coal now on the market at very low rates, to exclusion of demand for the domcstic at prices that will pay the cost of production, they are willing to make some concession of wages, the majority are unwilling to make concession to the extent of twenty-five per cent. Whether the ultimatum on either side has been yet stated, we have no present means of learning. It is unquestionably a very difficult thing for the proprietors to run the mines against present competition in the coal market without ruinous loss; and it would almost equally involve ruinous loss to stop pumping and working the mines for any length of time, even for a few weeks, for the cost of pumping down the water, clearing and retimbering the shaft, gangways, shutes, and tunnels, would be enormous, and it may be a question if the coal yet to be worked out in them will ever pay a profit on such cost. To avoid such a calamity, therefore, as the closing of the mines would be to all parties, every reasonable concession is called for on the part of both employers and employés." The Bellingham Bay and Coos Bay Mines are bringing restricted supplies to market, while those of the Wellington and other British Columbia mines have lessened their production not a little the past few months. Among the arrivals the past week we note the following: *Cuba*, from Liverpool, 1,438 tons; *Elizabeth*, Newcastle, Eng., 1,356 tons coal, and 59 tons coke; *Kate Kelloch*, 1,550 tons, Sydney; bark *Wellington*, 921 tons, Nanaimo; *Empire*, 560 tons, Coos Bay. As our readers well know the great bulk of the arrivals for months past was sold upon contract at or about the time of the ships' loading in Great Britain or her Colonies, therefore spot quotations have been more or less nominal, or confined to jobbing lots from second hands. We cannot now quote English or Scotch Steam better than $7.50@7.75; Australian, $7.75 @8.25, according to description; Anthracite, $12@15; Cumberland, $14@16; Seattle, $9; Coos Bay, $8.

St. Louis. Oct. 16, 1876.

Reported by JAS. J. SYLVESTER, Secretary of the Anthracite Coal Association.

Retail prices, delivered.

ANTHRACITE.	per ton.
Lackawanna	$9 00@10 00
Wilkes-Barre	9 00@10 00
Schuylkill	9 00@10 00
Lehigh	11 00@12 00

BITUMINOUS.	
Blossburg	9 00
Pittsburg	4 50
Indiana Block	4 00
Big Meadow	3 00
Illinois Coals	2 50@3 00
Connellsville Coke	6 00

Toledo, Ohio. Oct. 15, 18;6.

Specially reported by GOSLINE & BARBOUR.

We quote as follows for retail delivery:

Lackawanna lump	$6 75	Lehigh lump	$7 75
" egg	6 75	" egg	7 75
" stove	7 00	" stove	8 00
" chestnut	6 75	" chestnut	7 75

Soft Coal.

Hocking lump	4 00	Brier Hill	5 75
" nut	4 00	Blossburg	8 00
Willow Bank lump	4 50	Cumberland	8 00
" " nut	4 00		

Montreal. Oct. 16, 1876.

Specially reported by Messrs. ROBERT C. ADAMS & Co.

Wholesale per ton of 2240 lb.

Scotch Steam	$4 25	Cape Breton Steam	$3 75
Pictou "	4 25	Newcastle Smiths	5 50

Anthracite at retail, per 2000 lb., delivered.

Egg	$6 25	Chestnut	6 25
Stove	6 75		

Rates of Transportation on Anthracite Coal to Tide Ports.

Our issue of the 16th ult. contains very full information on the above, and from which no change has occurred since that date.

Freights

Representing the latest actual charters up to Oct. 20, 1876.

Per ton of 2240 lb.

PORTS.	From Philadelphia.	From Baltimore.	From Georgetown.	From Elizabethport, Port Johnson, South Amboy, Hoboken and Weehawken.
Augusta, Me	....	....	....	....
Albany	....	....	....	....
Alexandria	....	....	....	....
Amesbury, Mass	....	....	....	1 75
Bangor, Me	....	....	....	1 50
Bath, Me	....	2 00	2 20	1 50
Baltimore	....	....	....	....
Boston, Mass	1 80@2 00	2 00	2 10	1 50
Bridgeport, Ct	1 15†	1 75	....	80
Bristol, R. I	1 60	....	....	1 00
Cambridgeport, Mass.	2 00@2 10	....	....	1 50
Derby	....	....	....	....
Dighton	....	....	....	....
East Cambridge	2 00@2 10	....	....	1 50
Fall River	1 60	1 75	1 90	1 00
Hackensack	1 12†	....	....	....
Hallowell, Me	....	....	....	....
Hartford	1 75@2 00	....	....	1 00
Hoboken	†95	....	1 55	45
Hudson	1 10	....	....	....
Jersey City	†35	....	1 55	45
Lynn, Mass	....	....	....	‡1 50
Middletown	1 75@2 00	....	....	1 15
Mystic	....	....	....	....
Newark	†95	....	....	....
New Bedford	1 75	1 75	2 00	1 15
Newburyport	2 00	2 15	2 25	1 70
New Haven	1 10†	1 75	1 85	80
New London	1 60	1 75	1 90	80
Newport	1 62	....	....	1 10
New York	†95	1 50	1 60	45
Norfolk	....	....	75	75
Norwalk	1 10†	....	....	80
Norwich	1 60	....	....	1 00
Pawtucket	1 75	....	....	‡1 10
Philadelphia	....	....	....	....
Portland	2 0 @2 15	2 10	2 20	1 35
Portsmouth, N. H.	2 00@2 10	2 15	2 25	1 70
Providence	1 60	1 75	1 90	1 10
Poughkeepsie, N. Y.	1 10†	....	....	....
Rockport	....	....	....	....
Saco	....	....	....	....
Sag Harbor	....	....	....	....
Salem, Mass	2 10@2 15	2 00	....	1 50
Salisbury Pt., Mass	....	....	....	....
Stamford	1 10†	....	....	....
Stonington	....	....	....	....
Taunton	.. .	....	....	....
Troy	1 15†	....	....	....
Warren, R. I	....	....	....	1 10
Wareham	....	....	2 10	....
Washington	....	....	....	....
Weymouth	....	....	....	....
Wilmington, Del	....	....	....	....

* And discharging and towing. † And discharging. ‡ And towing. $ 3c. per bridge extra.

IRON MARKET REVIEW.

New York.

FRIDAY EVENING, Oct. 20, 1876.

American Pig.—The Thomas Iron Company reports that it has stopped taking orders because it is largely sold ahead. This company reports a good inquiry, but other companies continue to do a very quiet business. There are no new features worthy of note in the trade. We quote No. 1 foundry at $22; No. 2, $20; and forge, $19@20.

Scotch Pig.—We note sales of 100 tons of Eglinton and 100 tons of Coltness on private terms. We quote Eglinton at $26; Glengarnock, $27; and Coltness, $28@ $28 50.

Rails.—We learn of no important transactions. We quote as before: iron rails at mills at $36@41, and steel at $52@54.

Old Rails are very quiet, and nominally quoted at $21.

Scrap Iron.—Without transactions this is quoted at $26@27 for No. 1 wrought.

Baltimore. Oct. 18, 1876.

Specially reported by Messrs. R. C. HOFFMAN & Co.

The sales of pig iron for the past week have been light, at about following prices:

Baltimore Charcoal	$30@34	Anthracite No. 3	$20@21 00
Virginia Charcoal	28@34	Mottled and White	17@19 00
Anthracite No. 1	23@24	Charcoal C.B.Blooms	60@65 00
" No. 2	21@22	Refined Blooms	50@55 00

Boston. Oct. 16, 1876.

PIG is moving in a fairly steady way in small lots, but at very low and irregular prices. Offers of large lots of prominent fancy brand No. 1 at $21 f. o. b. in New York would not be accepted, the foundry being satisfied with the price but not wanting at one load so large a quantity. There is little interest in gray forge, the offers of scrap being rather more plenty.

BAR continues to job in a moderate way at from $49 upwards for refined, and $40 for common. The stocks held here are fair, and not at that very profusely assorted; still there is sufficient by swapping and reselling to fill all orders.

STEEL sells in a fair and steady way for small machinery and sleigh. A small call exists for choice tool steel.—*Commercial Bulletin.*

Chattanooga, Tenn. Oct. 16, 1876.

Specially reported by J. F. JAMES pig iron broker, etc, 233 Market Street.

The market during the past week has shown more activity than for several weeks past. Stocks are very light, and demand greater than the supply. Cold Short Mill is especially in demand, at fair prices. I note sales here and below, during the past week, of 850 tons of No. 1 Mill. Foundry grades for the West and South are active. I note a sale of 300 tons of No. 2 Charcoal Foundry for St. Louis. A far better feeling exists among our coke and furnacemen, and some talk of erecting a couple more coke furnaces here, or at some point near.

I quote on the usual terms:

Tenn. Ala. and Ga. Charcoal, No. 1 foundry		$20@	21
" " " " No. 2 foundry		19@	20
" " " " gray forge		16@	17
" and Georgia coke, No. 1 foundry		18@	19
" " " " No. 2 foundry		17@	18
" " " " gray forge		15@	16
White and Mottled		14@	15
Tennessee and Georgia cold-blast car wheel		21@	22
Alabama " "		21@	22
Old Rails	cash	20	50
Cast Scrap	"	13	
Wrought Scrap	"	18@	—

Cleveland, Ohio. Oct. 16, 1876.

Messrs. C. E. BINGHAM & Co., quote as follows:

Per gross ton, on four months' time. Subject to change in market. Discount for cash 4 per cent.

FOUNDRY IRON.

No. 1, Lake Superior Charcoal	27	00@	....
No. 2, " " "	26	00@	....
No. 1, Anthracite	25	00@	....
No 2, "	23	00@	....
No. 1, Bituminous	24	50@	....
No. 2, "	23	00@	....
American Scotch, No. 1, Cherry Valley		@	....
" " B—1, " "		@	....
" " No. 2, " "		@	....
No. 1, Massillon	25	50@	....
B—1, "	24	00@	....
No. 2, "	21	00@	....

CAR WHEEL AND MALLEABLE IRON.

No. 3 Lake Superior Charcoal	27	00@	....
No. 4 " " "	27	50@	....
Nos. 5 and 6 "	27	00@	....

BESSEMER IRON.

Nos. 1 and 2 Lake Superior Charcoal	27	00@	....

FORGE IRON.

No. 1, Gray	22	00@	....
White and Mottled	21	00@	....

Cincinnati. Oct. 16, 1876.

Specially reported by Messrs. TRABER & AUBERY, commission merchants for the sale of pig iron, blooms, ore, etc.

There is more activity in our pig iron market, and prices are firm at quotations.

Louisville. Oct. 16, 1876.

Specially reported by Messrs. GEORGE H. HULL & Co.

The market shows a stronger and steadier feeling than for several months back. The disposition to force sales seems to have entirely passed away, and holders are now firm at full market figures.

The usual time, four months, allowed on quotations below.

HOT BLAST—CHARCOAL.

No. 1 Foundry, from Hanging Rock Ores	$24	00@25	00
No. 2 " " " "	22	00@23	00
No. 1, Mill, from " " " "	20	00@21	00
No. 1, Foundry, from Alabama, Georgia and Tennessee ores	22	00@	——
No. 2, Foundry, from Ala., Geor'a and Tenn. ores	20	00@21	00
No. 1, Mill, from " " " "	20	00@21	00

HOT BLAST—STONE COAL AND COKE.

No. 1, Foundry, from Hanging Rock Ores	22	00@23	00
No. 2, " " " "	20	00@21	00
No. 1, Mill, " " " "	19	00@20	00
No. 1, Foundry, from Ala. Ga. and Tenn. Ores.	21	00@22	00
No. 2, " " " "	20	00@21	00
No. 1, Mill, " " " "	19	00@20	00
No. 1 Foundry, from Missouri Ores	——	@	——
No. 2 " " " "	——	@	——
No. 1 Mill, from Missouri Ores	23	00@25	00

COLD BLAST—CHARCOAL.

Car Wheel from Hanging Rock Ores	35	00@43	00
" " Tennessee "	26	00@28	00
" " Alabama and Georgia Ores	28	00@40	00
" " Kentucky Ores	28	00@42	00

Milwaukee. Oct. 16, 1876.

Iron remains much the same—sales small.

per ton of 2,240 lb.

Frankfort L. S. Charcoal, No. 1	$28	00	
" " " No. 2	27	00	
" " " No. 3, 4 & 5	25	00	
" " " No. 6	25	00	
Mil. Anthracite L. S., No. 1	27	00	
" " " No. 2	26	00	
Wisconsin Iron, No. 1	26	00	
Mahoning Valley Bit's No. 1	32	00	
" " " No. 2	30	00	

Pittsburg, Pa. Oct. 17, 1876.

Specially reported by A. H. CHILDS.

For some weeks past the condition of the metal market has remained substantially unchanged. The mills are mostly carrying light stocks, and purchases are being made from time to time as necessity demands. Strictly first class red-short irons are comparatively scarce, and are held firmly; but other descriptions are in abundant supply; in some instances slight concessions are made in price or time to effect sales. Quotations are:

No. 1 Foundry	24 00@25—4 mos		
" 2 "	22 50@23 00	"	
Gray Forge	21 00@22 50	"	
White and Mottled	18 00@20	"	
Warm blast Charcoal	24 00@28	"	
Cold blast Charcoal Western	40 00@45	"	

Richmond, Va. Oct. 16, 1876.

Reported by ASA SNYDER, Esq.

There is still a scarcity of choice brands of charcoal pig iron. Quotations remain unchanged. About 200 tons have been sold since last report.

Virginia Cold Blast Charcoal Pig Iron	$27	to	$33
" Warm " " " "	24	to	28
" " " Coke " " 1 X	23	to	24
" " " " " " 2 X	21	to	22
" " " " " " 3	20	to	21
" Anthracite 1 X	—	to	—
" " 2 X	—	to	—
" " 3	—	to	—

San Francisco, Cal.

From the *Commercial Herald*, Oct. 12, 1876.

The stock of Pig Iron is excessive, imports for nine months past 19,013 tons from all quarters; same time in 1875, 18,228 tons. The consumption, we think, has been less this year than last, thus leaving a large stock in the hands of foundrymen, quotable now at $30 nominal. Tin plate is in large supply. The last sale of Sydney Tin was at 18¼c. We quote I.C. coke, $7.50; I.C. charcoal, $8.50@9; I.X. ditto, $10.50@11; roofing plate, $8.25. The *Blue Jacket* for New York has 3,490 pigs pig lead, or 221 tons.

St. Louis. Oct. 18, 1876.

Specially reported by Messrs. SPOONER & COLLINS, Commission Agents for all kinds of Iron.

Our market is quite active, and the demand good. Prices are very firm at quotations. Mill iron is very scarce.

Mo. Stone Coal No. 1 Fy.	$25@26		
" " " 2 "	23@24		
" " Gray Mill,	22½@23		
" Charcoal No. 1, Fy.	23@24		
" " " 2, "	22@23		
" " Gray Mill,	22@23		
Tenn. " No. 1, Fdy	23@24		
" " " 2, "	22@23		
" " Gray Mill	22@23		
Va. Coke, No. 1, Fdy.	24@25		
" " " 2, "	23@24		
" " Gray Mill,	21@23		
H. R. Char. No. 1, Fdy.	25@26		
" " " 2, "	24@25		
" " Gray Mill,	24@25		
Massillon Iron, A No 1	29@30		
" " B " 1	31@—		
" " " 2	28@—		
Cold Bl. Car Wheel, Mo.	30@33		
" " " " Tenn.	30@33		
" " " " Ala.	30@33		
" " " " H. R.	33@35		
Mo. Charcoal Blooms	50@65		
" Scrap "	45@55		
" " hammered Billets	75@80		
Assorted Bar Iron 2 50, 60 days			
No. 1 Wrought Scrap 90c. cwt.			
Heavy cast " "	70	"	
Light " "	50	"	

Montreal. Oct. 10, 1876.

Business for the past week has been on the whole pretty fair, there has been a good inquiry for Pig Iron from both dealers and consumers, and those who have not laid in a stock have now to pay considerably more than some short time ago. The stocks are small and when all the orders are filled there will be nothing of any account over. Bar Iron continues to move freely, but not under our quotations. Canada's, although selling at small profits and in good demand, are light in stock. Tin Plates are pretty much the same as last week. There is a little or no change in anything else. We continue to quote: Pig Iron Eglinton and Clyde; $18.50@$19; Carnbroe $19@$19.50; Summerlee and Glengarnock, $19.50@$20; Calder and Gartsherrie, $20@$20.50; Coltness, $21@$21.50; Hematite, $26.@28. Bar, per 100 lb., Scotch and Staffordshire, $2@2.15; best do., $2.25@2.30. Swedes and Norway, $4.75@5.00; Low Moor and Bowling, $6@6.50.—*Monetary Times.*

METALS.

NEW YORK, FRIDAY EVENING, Oct. 20, 1876.

THE rumors of war in Europe had a temporary effect upon the prices earlier in the week, but the whole market appears to have taken its old position.

Mr. ERNEST W. S. MURRANT, of London, under date of Oct. 6, says:

"The business of the past month has been of a restricted description, the political situation not being of such a nature as to inspire confidence in speculators or consumers, and the latter persevere in their policy of 'hand to mouth' purchases."

Gold Coin.—During the week under review, the price of gold has ranged from 109⅛ to 113¾, and closed at 110⅜.

Bullion.—The market for silver is very strong at 52⅝d.@52¾d. in London, while here 115@115⅝ are quoted, and in San Francisco, 10 per cent. discount. The prospects of war in Europe are giving considerable tone to the market.

Copper.—The latest quotations from London are £77 for Chili Bars, and £84 for Best Selected, which are advances from a week ago. Sales in this market of about 300,000 lb. of "spot" copper at 21@21¼c., are reported. It is also said that a considerable business has been done in "futures," at prices ranging from 21⅛c.@22c., although the latter figure is not generally credited. There are inquiries for about 900 tons of copper for export, but the prices offered are below the views of holders in this country. Our market closes strong at 21c.

Mr. MURRANT says of copper:—"Foreign descriptions have been remarkably steady of late, and the prices of yesterday did not differ more than 10/ from those of the 1st of September; but this is, perhaps, not saying much in favor of the article. It is said that the *Wallaroo* sale of the 26th of September went off better than certain speculators anticipated; however this may be, the demand has been pretty freely met since, at about £1 above the average sale price. The statistics are below:—

	1873.	1874.	1875.	1876.
Stocks in Europe on 1st of October....	29,083	24,235	23,243	24,894

Tin.—Straits is quoted in London at £74, or the same as a week ago. There is but very little business doing here. We quote straits at 17⅛@17⅜c.; gold; L. & F. 16¾c.; Refined 17c.; and Banca 20c.

Mr. MURRANT says of tin: "Stocks in this article continue to increase at a somewhat serious rate, there being now over 8,000 tons of foreign in London alone, with a prospect of a further increase of a couple of thousand tons or so within the next few months. There has been a drop since 1st September of about £1 in straits, the market closing yesterday with sellers at 71/ 6d. for spot lots. The following are the figures:

	1873.	1874.	1875.	1876.
Available stocks in London and Holland on Oct. 1st..	4,186	4,163	7,644	10,960

Tin Plates.—There is very little business doing in these. We quote as follows, in gold, per box: Charcoal tins, $7@$7.25, and ternes, $6.37½@$6.50; coke tins, $6@$6.12½, and ternes, $5.62½@$5.75.

MESSRS ROBERT CROOKS & Co., of Liverpool, under date of October 5, says of Tin Plates:—"Business in these for September was decidedly of a retail character, and makers, taken as a whole, are decidedly worse off for work now than they were at the beginning of last month. Notwithstanding this, so far, values have been well maintained, and, taking the market as a whole, only a slight decrease can be noted. Some few makers are beginning to show signs of relapse, and will, no doubt, if demand does not soon improve, shortly take orders at the best prices obtainable."

Lead.—There has been but very little business done during the past week. Prices range from 6·20c.@6·25c., currency, although large lots would have to be offered a a concession, to find purchasers.

Spelter and Zinc.—Domestic spelter is quoted at 6⅝c. currency, but very little business is being done.

Antimony.—This article is very quiet at 14¾@15c., gold.

Quicksilver is quoted at 48@49c., gold, per lb., here, and 43@45c. in San Francisco, while in London the price continues at £8 per flask.

The San Francisco *Commercial Herald*, say of quicksilver: "The market lacks animation, with restricted sales for export at 43@44c. It was stated on 'Change yesterday that a large consumer had bought extensively at 44c.

THE SALT LAKE CITY SILVER ORE MARKET.

Mr. J. B. MEADER, under date of the 14th inst., remarks:—"Markets about the same, although silver has advanced. Lead is weaker, and this fact has a tendency to contract the effect of the advance on silver."

Argentiferous Lead (Base Bullion).—$70 per ton for lead; $1.16 per oz. for silver; $20 per oz. for gold. The above quotation for silver is based upon a silver contents in the lead of 80 to 120 oz. per ton of 2,000 lb.

Argentiferous Lead Ores.—From 90 cents to $1 per oz. for the silver contained therein, based upon a standard of 40 per cent. lead, each unit above 40 per cent. 50 cents per unit added. Each unit below 40 per cent. 50 cents deducted. Extreme prices, and only for most desirable carbonate ores, free from zinc, copper, and antimony. Ores containing zinc—For each unit of zinc above 5 per cent., deduct the value of 1 oz. of silver. Ores with a lime or ferruginous gangue, subject to higher rates. Copper, antimony, zinc, and iron pyrites in all the above ores objectionable. Silver ruled through the week at 1.13 to 1.14½, purchases being made on Government account.

FINANCIAL.

New York Stocks.

NEW YORK, FRIDAY EVENING, Oct. 20, 1876.

THE improvement in the coal stocks during the week just closed have been quite marked, in some instances the extreme advance is over 17 per cent., the general market closes lower to-day, the average advance, however, is over 8 per cent., as compared with the closing quotations of a week ago. Rumors of a reorganization of the coal combination, and the demand for stock by the "short" element, for the purpose of covering their contracts, are the most probable reasons for this sud-

den advance. The transactions aggregate over 300,000 shares, an increase of some 25,000 shares over our last

New Jersey Central Railroad.—81,000 shares of this stock have changed hands between 32⅝ and 39¼, closing 2⅝ per cent. below the highest figure. We note a rumor from Philadelphia that buvers have appeared in that market for Central New Jersey stock. The new management is substantially a Pennsylvania interest, and if joined by the Baltimore and Ohio people, it will become a formidable rival to the Pennsylvania Central.

Delaware, Lackawanna and Western Railroad.—This stock has fluctuated widely during the week, the extreme range being nearly 13 per cent., the closing quotation of 78¾ showing an advance of nearly 9 per cent. from the quotation of a week ago.

Delaware and Hudson Canal Company.—About 16,000 shares of this stock have changed hands during the week, at between 65 and 82⅛, closing at 76½, an advance of 11¼ per cent.

Mariposa Land and Mining Company stock, under favorable advices from the mine, has advanced $1.50 per share, with sales of 1,265 shares for the week.

Bonds are not so active, and are generally lower.

Hampshire and Baltimore Coal Company.—At the regular stockholders' meeting of this company, held on the 19th inst., for the election of directors and officers for the ensuing year, the following gentlemen were unanimously elected:—MR. J. GEORGE REPPLIER, President; Mr. E. L. BOLLES, Vice-President; Mr. GEORGE D. POND, Secretary. Messrs. E. L. BOLLES, GEORGE H. POTTS, H. S. HENRY, GEORGE P. SATTERLEE, JAMES S. MERRIAM, EDWARD OOTHOUT, J. GEORGE REPPLIER, Directors.

Tennessee Coal and Railroad Company.—This company, which owns a railroad from Tracy City, Tennessee, south-west to a junction with the Nashville, Chattanooga and St. Louis, near Cowan, twenty-one miles, has just completed one and a half miles of road to some new coal mines just opened. The gauge is five feet.

Monday Creek Ohio Railroad.—A company by this name has been organized in Ohio to build a narrow-gauge coal road from Gore, on the Straitsville branch of the Columbus and Hocking Valley Road, northward to Anderson, about 10 miles. The capital stock is to be $50,000.

Quotations and Sales of Stocks and Bonds.

For the week ending Oct. 20, 1876.

STOCKS.

	Highest	Lowest	Closing	Shares sold.
Pennsylvania Coal Co	—	—	220	—
Consolidation Coal Co	—	—	33	—
Spring Mt. Coal Co	—	—	*55	—
American Coal Co	—	—	*54	—
Maryland Coal Co	10	9⅛	10	400
Del., Lack., and West. RR. Co	81⅞	69	78¾	206,755
New Jersey Central RR. Co	39¼	32⅝	37⅞	81,095
Delaware and Hudson Canal Co	82½	65	76½	15,531
Quicksilver Mining Co. pref'd	—	—	17	—
" " " Common	14	13	13	430
Mariposa Land & Min. Co. pref'd	7	6¼	6½	1,265
St. Louis & Iron Mountain RR	17	13	—	980
Total Shares sold				306,456
Sales for the week previous				280,838
Increase				25,618

*Nominal.

BONDS.

	Inter'st	Sales.	Price.
Del., Lack. & West. 2d M	M. & S.	5,000	@107
" " " 7's Con'ble	J. & D.	...	@100
Cent'l RR. of N.J., 1st M., New	F. & A.	11,000	110 @110¾
" " " 1st Cons	.....	3,000	80 @ 88
" " " Convert'le	M. & N.	9,000	87 @ 89
Lehigh & W.-B'e, Con. Guar'd	.....	8,000	67 @ 69
Am. Dock & Imp. Mt. Bonds	J. & J.	.....	@ 85
Del. & Hud. Can., 1st M., 1891	.....	13,000	@107½
" " " 1884	.. ....	3,000	@105
" " " 1877	.....	4,000	@104
" " " Coup. 7's, 1894	.....	3,000	@ 97
" " " Reg'd 7's, 1894	.....	.....	@ ....
St. L. & Iron Mountain, 1st M	F. & A.	7,000	100 @100½
" " " 2d M	M. & N	.....	@ 70
Chesapeake & Ohio 6's, 1st M	.....	2,000	@ 25
" " " Ex. Coupon	.....	.....	@ 20
Mariposa Gold Loan con. 7s	.....	.....	@100½
Total sales		$68,000	

Closing quotations, in the absence of sales, represent the latest prices bid.

Philadelphia Stocks.

PHILADELPHIA, Thursday Evening, Oct. 19, 1876.

THE dealings in the coal-carrying shares during the past week have amounted to 112,855 shares, a decrease of some 15,000 shares, as compared with the transactions in our last. Quotations are generally lower, and a fairly steady feeling has prevailed throughout the week.

Pennsylvania Railroad.—48,000 shares of this stock have changed hands, fluctuating within the range of 2 points, and closing at 47⅞, equal to an advance of ½ per cent.

Reading Railroad.—This stock is lower, the range for the week being between 24¼ and 22½, closing ¼ above the lowest price, and 2 points or 4 per cent. below the closing in our last; the sales amount to 53,488 shares. This company is reducing work at its shops in Reading and elsewhere.

Lehigh Coal and Navigation Co.—About 9,000 shares of this stock have changed hands between 33 and 31⅞, closing at the lower figure, which is a decline from our last equal to 3 per cent. The future of this stock depends in a great measure upon the payment or non-payment of the next quarterly dividend; and this payment entirely depends upon the ability of the New Jersey Central Railroad Company to pay tc the Lehigh Company what it owes on the tonnage and other requirements under the lease. This at the present time is very problematical. It is not only important to the stockholders of the navigation company that the dividend should be paid, but it is vital to the Central Railroad Company. The market cannot stand many more defaults, as the public mind is now very much demoralized on the subject of corporation credit; and the default of such a company as the Lehigh Navigation, the stock of which is held by a large number of small investors, who depend upon their income from it for their support, would be particularly unfortunate.

Lehigh Valley Railroad.—This stock closes at 48¼, a decline of ¾. The range in prices has been confined within two points, the sales aggregating nearly 2,000 shares.

The Geneva, Ithaca, and Sayre Railroad Company, the same that was sold under foreclosure of mortgage a month ago, and purchased by the Lehigh Valley Railroad Company, was reorganized at Waverly on the 17th inst., by the election of ROBERT A. PACKER, as President, CHARLES HARTSHORNE, as Treasurer, ROBERT H. SAYRE, as Chief Engineer, JOHN R. FANSHAWE, as Secretary, and WILLIAM STEVENSON, as Superintendent. The back coupons of the Ithaca and Athens Railroad Company bonds, it is announced, will be paid November 1. at the Lehigh Valley Railroad Company's office in this city.

Auction Sales of Stocks and Bonds for the week have been as follows:

Minehill and Schuylkill Haven Railroad.—38 shares at $50.25 per share.

Nesquehoning Valley Railroad.—20 shares at $50.25 per share.

Danville, Hazleton, and Wilkes-Barre Railroad.—$2,000 1st mortgage 7 per cent. bonds, coupons on until 1879 at 18 per cent.

Keystone Furnace Company.—$45,000 1st mortgage 7 per cent. bonds, at 67½ per cent.

Morris Canal and Banking Company.—$900 of the 7 per cent. bonds, at 106 per cent.

Wilmington and Reading Railroad.—$1,000 1st mortgage 7 per cent. bonds at 31¼ per cent.

The Diamond Coal Company announces a quarterly dividend of 75 cents per share, payable on demand.

Quotations and Sales of Stocks and Bonds.

For the week ending Oct. 19, 1876.

STOCKS.

	Highest	Lowest	Closing	Shr s
Lehigh Valley RR. Co	49½	47½	48¼	1,939
Pennsylvania RR.	48¾	46¼	47¾	48,203
Reading RR.	24⅞	22¾	22¾	53,488
Lehigh Coal and Nav. Co	33	31⅞	31⅞	9,197
Penn. Canal	—	—	*9	—
Buck Mountain Coal Co	—	—	*25	—
Fulton Coal Co	—	—	*3½	—
Locust Mountain Coal Co	—	—	—	—
Westmoreland Coal Co	—	—	*85	—
St. Nicholas Coal Co	—	—	*1	—
Cambria Iron Co	—	—	*16	—
Crane Iron Co	—	—	*25	—
Emaus Iron Co	—	—	—	—
Pennsylvania Salt Manufact. Co	—	—	68	28
Total shares sold				112,855
Sales for the week previous				127,912
Decrease				15,057

* These quotations are nominal.

BONDS.

	Sales.	Price.
H. and B. T. RR. 1st mortgage, 7s	$ —	— @107
" " " 2d " "	—	— @102
" " " 3d " cons	—	— @ 38
Lehigh Valley RR. Con. mtg. 6s	11,000	— @ 99
" " " 7s, 1910	—	— @111
" " " 6s Reg	1,000	— @108¼
" " " 6s coup	1,000	— @107½
Pennsylvania RR., 1st mtge. 6s	6,000	— @1C7
" " gen. " con. 1910	—	106½@107
" " gen. " 7s, reg	3,000	— @104
" " Cons. M. 6s reg	1,000	— @100½
Phil. & Reading RR. Con. M. 7s Reg	2,000	— @104
" " " G. M. 7s, coup	3,000	— @105
" " " Gen. M. 7s reg.	—	— @103
" " new convertible 7s	25,000	72½@ 79¼
" " 7s '93	1,000	— @106¾
" " Cons M.7s coup	1,000	— @103
" " debenture 6s	—	— @ 69
Phil. & Reading C. & I. Co. Deb. 7s	5,000	— @ 69
" " Tamaqua tract	5,000	— @ 66
Lehigh Coal & Nav. Co., 6s '84	1,900	100 @101
" " " RR. 6s, '97	2,100	100 @100¾
" " " con. 7s	1,000	— @ 95
" " " 6s gold loan	6,100	99¼@100
" " " Conv. gold loan	—	— @102
Penn. Canal, 6s	—	— @ 71
Penn. and N. Y. Canal, 7s	2,000	— @110½
Ches. and Del. Canal, 6s	—	— @ 85
Susquehanna Canal, 6s	—	— @ 70
Delaware Division Canal, 6s	—	— @—
Susquehanna Coal Co. 6s	—	— @ 77
Buck. Mount Coal Co. 6s	—	— @—
Penn. Gas Coal Co. 6s	—	— @—
Honeybrook Coal Co. 7s	—	— @—
Total amount of sales	$78,100	

Closing quotations, in the absence of sales, represent the latest prices bid.

Copper Stocks.

Specially reported by Messrs. WILSON W. FAY & Co., Bankers and Brokers, Room 7 Traveller Building, 31 State Street, Boston.

BOSTON, THURSDAY EVENING, Oct. 19, 1876.

THE market closes steady on copper stocks. There seems to be as yet few orders to purchase, but there are fewer sellers. The feeling seems to be that we are on the verge of a bull campaign. Calumet very strong at $177 bid, an advance of about $5 per share the last week. Central is stronger at $36 bid, with little offering. Copper Falls holds its own, and that is about all. Duncan Silver opened the week at $12 bid, sold down to 10, back to 12, and closes at 11 bid. National is in demand at 2⅝ and undoubtedly will go higher. Petherick has been in demand from 65 to 75. Quincy is one point higher at $49 bid. Ridge stronger at 6¾ bid.

Gold and Silver Stocks.

AMERICAN MINING BOARD.

NEW YORK, FRIDAY EVENING, Oct. 20, 1876.

THE transactions of the American Mining Stock Board for the six days just closed, amounts to about 53,000 shares; this is an increase of over 22,000 shares, as compared with the sales of the previous week. Prices are generally well maintained, and some of the Comstock stocks show decided advances. We note the rumor that "an arrangement has been made whereby the two great mines will hereafter be regulated to yield 550 tons each, per day. Ore of equal grade can be taken out of both, which will give a monthly yield of $1,500,000 from each mine, and which can be easily increased to $2,000,000 each, if desired, thus giving a larger yield than ever yet attained from the bonanza."

The principal feature of the market has been the rapid advance in Ophir, which has taken place to-day, and the large apparent sales of Grant stock which we note in our editorial columns. The Mining Stock Board appears to be growing in favor, and we believe will, with judicious management, become a most useful institution. Many gentlemen of undoubted standing are joining, who at first held aloof.

Cederburg Northern Extension Gold Mining Company.—This mine is situated in El Dorado County, California. It has a capital of $2,240,000, divided in 22,400 shares of the par value of $100 each. There are 1,120 feet on the vein. We note sales of nearly 1,000 shares on the board during the week, at from $4⅞ to $5 per share. This stock is not on the regular list.

East Justice Gold and Silver Mining Company.—We note sales of 1,100 shares of this stock between 1⅛ and 1⅞ per share.

San Francisco Stock Market.—The *Commercial Herald* of the 12th inst. has the following:

"The mining stock market is exceedingly languid, and a dullness and declining influence has crept over it which it seems no effort can throw off. The many that have been holding on for an improved condition of affairs are becoming despondent and a distrustful feeling is manifesting itself in outside quarters to such an extent that business has been centered in the more prominent stocks which were put out to a very large extent at reduced prices, some of them falling very rapidly. Almost without an exception prices are lower, and judging from the rather strong desire to feed the market still lower rates may be looked for. The aggregate sales for the week, in the San Francisco Board, were, $3,358,000 against $2,725,000 the previous week."

Ophir.—Daily yield 300 tons of ore, keeping the mills running as usual. The ore breasts have shown a decided improvement during the past few days, the car samples to-day averaging $130 per ton. Timbering the main incline is nearly completed down to the 1700-feet level. It is expected that everything will be in readiness to commence sinking for the 1800-feet station by the first of next month. The ore producing sections of the mine are all looking well. especially the east ore body on the 1600-feet level, which is widening out and growing richer as the stopes go southward. The north and south drifts from the winze 50 feet below the 1600-feet level are in very promising quartz. Both of these drifts have some distance to run westerly to cut the ore bodies on the 1600-feet level. The south drift is further advanced than the north drift and is evidently in close proximity to ore. The west crosscut from the north drift on the 1600-feet level is in favorable vein matter, and is evidently approaching the ore body cut by the drifts further south. On the 1700-feet level cleaning out and repairing the east drifts and crosscuts preparatory to a renewal of the prospecting operations in that portion of the mine is making good progress.

Consolidated Virginia.—Daily yield, 550 tons of ore. The ore breasts on the 1400, 1500 and 1550-feet levels are showing finely. Those being opened on the 1550-feet level are especially rich, opening, as the work advances, with as rich. if not better prospects than any ever developed on the upper levels The Consolidated pan and battery mill have been started into full working operation. The starting up of this mill makes an addition of 300 tons of ore per day to the crushing capacities of the mine, and will enable the management to easily increase the yield of bullion to the old figures of $2,000,000 per month if they so desire. The drift south, on the 1600-feet level, running through the ore vein to connect with the north winze below the 1550-feet level of the California, is progressing at the rate of four feet per day, the face still in ore of the richest and finest character. This body of ore so far as penetrated, is of a hard, solid formation that betokens not only a continuation of the magnificent width of the vein on the level above, but also a huge, rich mass with no ordinary poor ores mixed with the good. The diamond drills on the 1700-feet level are being daily advanced to tap the body of water in the bottom of the south winze, below the 1550-feet level. The 1700-feet station in the C. & C. shaft, has been opened and a drift started to tap the ore vein on that level. This drift is advancing at the rate of about nine feet per day.

California.—Daily yield, 550 tons of ore, keeping the mills running steadily as usual The ore stopes on the 1,500-feet level are yielding rich ore, and have never shown better in the past than they do to-day. The mine in fact is now in better shape throughout, and the ore developments in every portion of it showing more extensive and lasting than ever in the past. The character of the ores are such that if the management so desired they could without much effort raise the yield to $2,000,000 or $2,500,000 per month without the addition of another stamp or the extraction of a ton more of ore than it now yields. Sinking the C. & C. shaft is making steady progress, the flow of water at the bottom being still as strong as ever. The pumps continue to drain the flow of water, although kept running up to their fullest capacities.

MINING STOCKS.

AMERICAN MINING BOARD'S LIST.

Name of Company.	Location.	Feet on Vein.	Capital Stock.	a No. of Shares.	Total Assessments Levied.	Date and Amount of Last Assessment per share.	Total Dividends paid.	Date and Amount of Last Dividend per share.	CLOSING QUOTATIONS g American Currency. Sat.	Mon.	Tues.	Wed.	Thurs.	Fri.	SHARES SOLD DURING THE WEEK.
Alpha Cons. G. S.	Nevada,	300	$ 3,000,000	30,000	$180,000	Aug. 12, '75, $1.	....	.....	$50 00	$46 00	$51 62½	$50 00	$50 00	$48 25	1,000
Belcher, G. S.	Nevada,	1,040	10,400,000	104,000	660,400	April 14, '71, $4.	$15,397,200	April 10, '76, $1.	*22 00	20 00	21 25	....	20 00	*22 25	700
Best and Belcher, G. S.	Nevada,	545	10,080 000	100,800	136,192	July 13, '74, 50c.	....	.....	47 75	46 50	....	51 00	*51 50	49 50	1,150
Bullion, G S.	Nevada	943½	13,000,000	100,000	2,054,000	Sept. 22, '76, $2.50.	....	.....	....	....	32 50	....	33 00	33 50	750
Caledonia, G. S.	Nevada,	2,188	10,000,000	100,000	1,210,000	Aug. 28, '76, $1.00.	....	.....	10 62½	11 00	11 37½	13 02	11 00	11 75	1100
California, G. S.	Nevada,	600	54,000,000	540,000	....	.....	6,480,000	Oct. 16, '76, $2.	67 00	63 00	64 50	67 co	66 00	66 00	450
Centennial, G.	Califor.	66 acres	1,000,000	100,000b	....	.....	....	.....	....	.....	1 50	....	....	....	.....
Chollar Potosi, G. S.	Nevada,	1,400	2,800,000	28,000	1,282,000	June 26, '76, $5.	3,080,000	Feb. 10, '72, $1.	....	80 50	88 25	94 co	94 00	....	500
Cleveland, G.	Colo.	3,715	250,000	25,00 0b	....	.....	....	.....	7 50	*7 62½	7 62½	8 12½	8 50	8 75	5,350
Cons. Imperial, G. S.	Nevada,	468	50,000,00:	500,000	125 000	July 25, '76, 25c.	....	.....	4 25	4 50	4 50	4 37½	4 75	4 62½	4 75	3,200
Cons Virginia, G S.	Nevada,	710	54,000,000	540 000	411,200	June 11, '73, $3.	22,680,000	Oct. 11, '76, $2.	*56 00	54 50	55 50	57 00	50 00	58 00	730
Confidence, G. S.	Nevada,	130	2,496,000	24,960	243,840	March 18, '73, $1.	78,000	May 1, '65, $8.13½	*17 50	17 50	17 87½	....	....	*20 00	250
Crown Point, G. S.	Nevada,	600	10,000,000	100,000	1,073,370	Aug. 15, '76, $1.	11,588,000	Jan. 12, '75, $2.	11 87½	12 50	15 00	*16 50	*15 75	30 00	550
Eureka Cons. G. S. L.	Nevada,	..	5,000,000	50,000	100,000	May 26, '76, $1.	1,000,000	Aug. 5, '75, $1.	....	....	....	....	....	....	.....
Exchequer, G. S.	Nevada,	400	10,000,000	100,000	280,000	Sept. 22, '76, $1.	....	.....	15 50	15 00	15 50	16 50	15 00	15 50	1400
Gould and Curry, G. S.	Nevada,	621	10,800,000	108,000	2,018,000	Aug. 11, '76, $1.	3,826,800	Oct. 10, '70, $10.	15 50	15 co	16 co	17 50	15 50	16 75	700
Grant, G. S.	Nevada,	1,000	10,000,000	100,000	....	.....	....	.....	5 25	6 50	6 87½	4 87½	5 50	6 25	12,450
Hale & Norcross, G. S.	Nevada,	400	11,200,000	112,000	2,130,000	Aug. 8, '76, $1.	1,598,000	April 10, '75, $5.	8 75	9 00	8 75	12 co	*9 75	10 25	4700
Hukill, S.	Colo.	3,283	1,000,0.0	10,000	....	.....	10,000	$1	....	....	....	....	....	....	.....
Indian Queen, S.	Nevada,	1,000	3 000,000	60,000	....	.....	60,000	.....	....	....	....	7 75	....	7 75	200
Julia Cons. G. S.	Nevada,	3,000	11,000,000	110,000	110,000	Sept. 11, '76, $1.	....	.....	*8 50	....	8 50	7 75	8 00	8 00	1000
Justice, G. S	Nevada,	2,100	10,500,000	105,000	1,502,500	Sept. 14, '76, $5.	....	.....	19 00	18 75	26 00	26 00	28 00	28 25	1050
Kentuck, G S.	Nevada,	95	3,000,000	30,000	270,000	Dec. 3, '74, $1.	1,252,000	March 8, '70, $5.	....	....	12 00	....	*12 50	....	500
Kossuth, G. S.	Nevada,	2,700	5,400,000	108,000c	405,000	Aug. 15, '76, 50c.	....	.....	....	....	*2 50	*2 50	....	....	.....
Leopard, G. S.	Nevada,	1,500	5,co ,000	50,000	50,000	March 31, '76, $1.	87,500	Feb. 15, '76, 75c.	....	....	8 75	9 50	10 50	*11 00	3300
Mexican, G. S.	Nevada,	600	10,080,00.	100,800	100,80	Sept. 5, '76, 50c.	....	.....	30 00	28 75	29 00	31 50	29 25	30 50	1300
Merrimac, S	Mass.	1,500	500,000	5,000	....	.....	5,00c	Oct. 10, '76, $1.	40 25	40 25	40 25	39 75	39 62½	*40 00	750
Morning Star	Nevada,	1,600	8,000,000	8',000	....	.....	....	.....	....	....	....	....	....	....	.....
Northern Belle, S.	Nevada,	1,600	5,000,000	50,000	....	.....	800,000	Sept. 15, '76, $1.	....	....	30 00	25 50	*27 00	*28 25	200
Ophir, G. S.	Nevada,	675	10,080,000	100,800	2,034,400	May 14, '75, $2.	1,394,4 0	March 9, '64, $4.	45 50	48 37½	50 50	53 75	....	62 00	1000
Original Comstock, G. S.	Nevada	....	10,000,000	10,000	....	.....	....	.....	....	....	....	2 37½	....	2 25	1700
Overman, G. S.	Nevada,	1,200	3,840,000	38,400b	2,107,080	June 26, '76, $3.	....	.....	*90 00	86 50	*95 co	10 1 00*	*94 00	....	.....
Pleasant View	Colo.	1,200	200,1 00	20,000	....	.....	....	.....	*2 75	*3 00	*1 00	*2 75	2 50	*3 00	600
Raymond and Ely, G. S.	Nevada,	5,000	3,000,000	30,000	510,000	Nov. 5, '75, $3.	3,075,000	Sept. 10, '73, $3.	....	....	6 50	*7 50	....	....	100
Santiago, G. S.	Nevada,	2,000	11,200,000	112,000	....	.....	....	.....	....	12 50	....	....	....	12 75	200
Savage, G.S	Nevada,	800	11,200,000	112,000	2,746,000	May 31, '76, $2.	4,160,000	June 11, '69, $3.	14 37½	*16 50	14 37½	17 25	15 75	15 87½	965
Seg. Belcher, G.S.	Nevada,	160	640,000	6,400	244,800	April 11, '76, $5.	....	.....	....	79 50	*80 00	80 00	....	....	100
Sierra Nevada, G. S.	Nevada,	3,630	10,000,000	100,000	1,400,000	Aug. 22, '76, $1.	102,500	Jan. 16, '71, $1.	13 00	*13 50	14 00	....	*15 00	14 50	650
Silver City, G. S.	Nevada,	3,900	6,310,000	63,100	....	.....	....	.....	....	....	....	*2 50	*3 25	....	.....
Silver Hill, G. S	Nevada,	5,470	10,800,000	108,000	810,000	Sept. 18 '76, $1.	....	.....	....	....	....	*12 00	....	10 00	.....
South Comstock, G. S.	Nevada,	1,500	10,000,000	100,000	44,000	May 3, '76, 10c.	....	.....	....	....	....	....	....	....	400
South. California, G. S	Nevada,	1,500	5,000,0.0	50,000	....	.....	....	.....	....	.. ..	....	....	....	....	.....
Southern Star, G. S.	Nevada,	1,500	6,000,000	600,000	....	.....	....	.....	....	....	....	....	....	2 25	700
Trenton, G. S.	Nevada,	..	10,000,000	100,000	....	.....	....	.....	....	....	13 co	....	....	....	.....
Union Cons. G. S.	Nevada,	850	10,000,000	100,000	260,000	March 3, '76, $1.	....	.....	....	....	16 02	14 50	....	13 00	400
West Belcher, G. S.	Nevada,	1,000	10,000,' 00	100,000	....	.....	....	.....	....	....	....	....	....	....	.....
Yellow Jacket, G. S.	Nevada,	1,200	12,030,000	120,000	2,598,000	July 18, '76, $1.	2,184,000	Aug. 10, '71, $2.50.	25 50	25 50	....	29 00	25 00	26 02	1,300
Young America, S.	Nevada,	1,000	3,000,600	30,000	6,000	Oct. 23, '76, 20c.	....	.....	....	....	....	....	....	....	.....

Assessments levied to date, $27,105,582 Div'ds pd. to date, $80,923,400 Total sales..... 51,795

BOSTON STOCK MARKET

									Fri.	Sat.	Mon.	Tues.	Wed.	Thurs.	
Allouez, C.	Mich.	..	$1,000,000	20 000 c	$940,000	May 9, '76. $5.	....	.....	....	....	...	....	....	....	.....
Calumet and Hecla, C.	Mich.	2¾ mile	2,000,000	80,000d i	1,200,000	.....	$10,650,000	Aug. 15, '76, $5.	174 00	174 02	175 00	175 00	176 00	178 00	.....
Central, C.	Mich.	..	500,000	20,000c	100,000	June, '62. 65c.	1,020,000	Feb. 17, '76. $5.	35 00	35 00	35 00	35 00	35 00	36 co	.....
Copper Falls, C.	Mich.	..	1,000,000	20,000d	535,000	May 10, '76,	100,000	Nov., '71, $1.	5 50	5 50	5 37½	5 50	5 62½	5 25	.....
Dana, C	Mich.	..	503,000	20,000d	68,000	Jan., '73, 50c.	....	.....	18	16	16	16	16	16	.....
Dawson, S.	Canada.	..	1,200,000	60,000f	....	.....	.. ..	.....	30	30	28	27	30	29	.....
Duncan, S.	Canada.	..	1,200,000	60,000f	75,000	July, '76, 41⅔.	....	.....	12 25	11 75	11 00	10 00	11 50	11 50	.....
Franklin, C	Mich.	..	500,000	20,000d	360,000	June, '68, $5.	585,000	Nov., '71, $1.	15 00	15 00	15 50	15 50	15 25	15 00	.....
Humboldt, C	Mich.	..	500,000	20,000d	100,000	Sept. 28, '76, 15c.	....	.....	10	....	....	....	....	8	.....
International, S.	Canada.	..	1,200,000	60,000f	....	.....	....	.....	1 37½	1 25	....	1 06¼	1 183¼	1 25	.....
Madison, C.	Mich.	..	50 1,000	20,000d	123,000	Sept. 11, '74, 10c.	....	.....	35	....	35	35	....	35	.....
Menard, C.	Mich.	..	500,000	20,000d	160,000	April 12, '65, 50c.	....	.....	50	....	50	50	50	50	.....
Minnesota, C.	Mich.	..	1,000,000	20,000e	436,000	June 10, '69, $1.	7,820,000	Mch. 15, '76, 50c.	2 00	....	2 00	2 00	2 00	2 00	.....
National, C	Mich.	..	500,000	20,000e	195,000	Oct., '75, $1.	360,000	Oct., '73, $1.	2 12½	2 50	2 37½	2 50	2 50	2 50	.....
Osceola, C	Mich.	..	1,000,000	40,000d	880,000	May 1, '76, $2.	....	.....	22 00	22 00	....	21 00	22 00	22 00	.....
Petherick, C.	Mich.	..	503,000	20,000d	165,533	March 22, '76, 50c.	....	.....	65	65	70	70	75	75	.....
Pewabic, C.	Mich.	..	503,000	20,000d	185,000	June, '68, $3.	460,000	July, '73, $1.	4 50	4 87½	5 00	5 00	5 00	5 00	.....
Phenix, C.	Mich.	..	1,000,000	20,000d	817,500	Sept., '70, $3.	....	.....	....	....	....	....	....	....	.....
Quincy, C.	Mich.	..	h 200,000	20,000b	....	.....	2,050,000	Oct. 28, '76, $3.	48 50	49 00	50 00	50 00	50 00	50 00	.....
Ridge, C.	Mich.	..	500,000	20,000d	....	.....	....	.....	6 12½	6 25	6 37½	6 37½	6 62½	7 00	.....
Rockland, C	Mich.	..	500,000	20,000d	495,000	Jan., '74, $1.	....	.....	45	..	45	..	..	45	.....
Star, C.	Mich.	..	500,000	20,000d	265,000	March 30, '76, 50c.	....	.....	50	..	..	..	50	50	.....
Superior, C.	Mich.	..	500,000	20,000d	340,000	March, '74, 25c.	....	.....	20	20	20	20	20	20	.....

Assessments levied to date, $7,440,033 Div'ds paid to date, $23,045,000 Total Sales .. ..

G. Gold. S. Silver. L. Lead. C Copper. *a* The par value of shares is $100, unless otherwise designated. *b* Par value $10. *c* Par value $50. *d* Par value $25 each. *e* Par value $15. *f* Par value $20 *g* Closing quotations represent the latest prices bid. Prices asked will have a * affixed. *h* Full paid. *i* On the four old companies.

Savage.—The heavy flow of water struck last week is being again gradually overcome by the united efforts of the small pumps, used in conjunction with those of the Hale and Norcross. A new air compressor has been received at the mine, which will be placed in running order in a very short time, and which will afford ample power to run all the small pumps and feed the large 14-inch pump as fast as the pumping engine at the surface can hoist the water. The Hale and Norcross are preparing to put another force pump in their main incline, when it is believed that the combined pumping machinery will handle the water with perfect ease. It should be understood that even while the water rises in the shaft the pumping goes steadily ahead without the least cessation or interruption. Every gallon of water raised lessens the amount of water contained in the large reservoirs tapped under ground, and the cause of the sudden rises is supposed to come from the giving way of reservoirs of water on the lower levels, the head or pressure being so great as to rush a body of water into the shaft much greater than the capacities of the pumps.

Justice.—Daily yield about 160 tons of ore. The ore breasts continue a good yield of ore of increasing value. The yield of the mine for the past three months under the present superintendency and management has been steadily on the increase. For the month of July it amounted to only $56,000; in August, $75,000; and in September, $145,000; and will, if nothing unusual happens to prevent, reach $175,000 for the month of October. Arrangements are also being made for the addition of still another mill in a short time, which will add still more to the bullion production of the mine. The prospecting drifts on the 800-feet level of the mine are being driven ahead without any material changes during the week. All three of the cross-cuts are showing well. But little has been done on the 1,000-feet level during the week, owing to the shaft having been used most of the week for repairing the pump-rods which were getting too old and worn for further use.

Chollar Potosi.—Daily yield 100 tons of ore, the assay value of which is $32 per ton. The old ore stopes show no material change, and the ore extracted no difference in quality. Sinking the main incline is progressing at the rate of 2¼ feet per day. Sinking the Combination shaft is also making good progress. The erection of new pumping engine for the Combination shaft is going steadily forward.

Yellow Jacket.—The drifts both east and west at the 2,040-feet level are pushing ahead in favorable looking vein material. At the 1,940-feet level the air pipes are in and drifting north is commenced, to meet and connect with drift coming south from the 2,135-feet level of the Imperial. The recently completed connection with the Crown Point mine at the 1,700-feet, by the south drift from the 1,740-feet station of the Yellow Jacket shaft, proves of very great benefit in the ventilation and cooling of both mines.

Crown Point.—Daily yield 60 tons of ore from the old upper levels of the mine. Crosscuts are soon to be started at several points on the 1,700-feet level to further settle the value of the ledge, although enough is already known to satisfy the most incredulous that the mine must be prospected deeper in order to find a renewal of the rich ore bodies found above. Sinking the main incline below the 1,800-feet level is making excellent headway.

Mexican.—The winze being sunk below the 1,465-feet level is showing an improvement, the ore giving fair assays. The formation overhead in the upraise has every appearance of an approach to a good body of ore above, and a crosscut east has been started on the 1,300 feet level to cut the vein above that point. The mine has not been prospected anywhere below the 700-feet level, and a series of drifts will be started as soon as practicable to crosscut the ledge on the several levels above the 1,300-feet level, in order to ascertain the value of that portion of the mine.

Union Consolidated.—The north drift on the 1,300-feet is still progressing in favorable ground. During the week an east crosscut has been started from this drift at a point 400 feet from the south line near the middle of the claim, which to-day shows very favorable indications of a near approach to the main ore vein.

Sutro Tunnel.—Total length of tunnel last evening, from mouth to face of header, 14,674 feet. The material now encountered is easy working porphyry, with clay seams, allowing of a very good rate of progres.—*Gold Hill News*, Oct. 12

Southern Star Gold and Silver Mining Company.—This location consists of a portion of what was formerly the old Sacramento and Santiago leads, and lies about 2 000 feet south of the Devil's Gate, and near the Amazon and Glasgow, adjoining the Santiago on the north. The location has been prospected here and there along the croppings of a double ledge, and a shaft sunk 150 feet. This work was done in 1861-2, and considerable ore taken out and milled. More recently a large shaft for permanent work has been located near the junction of the two leads, and through this the mine will be thoroughly and scientifically prospected.

Meadow Valley Mining Company.—There was some talk on the street yesterday about the Meadow Valley Mine starting up again. Telegrams passed back and forth, but up to the time of our going to press we heard nothing definite either way. If the foun ations were put through during the present fine weather, they could be finished and the pumping machinery in place by the time the snow flies. The mine is there with as good a prospect to-day as any non-dividend paying mine on the

Coast. If it were in another locality the stock would be $50 a share. We hope the management will decide to start up again. The prospect justifies all necessary outlay. The value of the mine is one thing, the management of the mine quite another.—*Pioche Record*, Oct. 11.

ASSESSMENTS.

We compile, from our exchanges, the following list of companies whose stock we do not quote, but who have levied assessments on their stockholders since the date of, and in addition to, the announcements in our issue of July 22d:

NAME OF MINE.	No. of feet on Vein.	Total No. of Shares.	No. of Assess.	Total sum levied.	Date of last assessment.
WASHOE MINES.					1876.
Amazon Consolid.	1,500	60,000	3	$30,000	August 8.
Alta	600	08,000	4	149,600	August 17.
Andres	2,000	100,000	7	250,000	Sept. 15.
Beach & Paxton	233⅓	60,000	2	19,000	August 30.
Brooks	1,500	100,000	2		July 10.
Daney	2,000	108,000	2	32,400	July 27.
Dayton	1,600	100,000	5	500,000	Sept. 8.
Dardanelles	1,200	60,000	4	240,000	Sept. 5.
Florida	1,200	50,000	6	187,500	Sept. 14.
Glasgow	1,500	60,000	3	30,000	August 8.
Imperial Consol.	468	500,000	1	125,000	July 25.
Insurance	2,000	30,000	3	18,000	August 30.
Lady Bryan	2,000	100,000	13	675,000	Sept. 15.
Lady Washington	1,200	60,000	8	228,000	July 26.
Lee	1,500	100,000	1	5,000	August 10.
Mides	200	37,000	1	6,000	August 15.
Mint	1,200	50,000	14	95,000	August 9.
Monumental	1,500	90,000	2	36,000	Sept. 7.
New York	1,000	100,000	10	595,000	August 29.
N.Cons'd Virginia	1,500	100,000	5	1,00,000	Sept. 1.
Pacific	1,200	00,000	1	20,000	Sept. 21.
Phil. Sheridan	1,200	24,000	5	72,000	August 9.
Picton	2,000	30,000	11	68,470	July 13.
Prospect	1,000	100,000	2	150,000	Sept. 28.
Santa Rosa	2,400	100,000	22	25,000	July 14.
Senator	1,200	24,000	14	123,600	Sept. 19.
Succr Mill & Min	3,800	68,400	16	473,100	Sept. 26.
Utah	1,000	20,000	13	380,000	July 11.
Wel's Fargo	1,500	108,000	5	75,600	July 6.
CALIFORNIA MINES					
Consolid. Amalor	1,850	30,000	..		
Defiance	1,500	100,000	1	50,000	July 17.
St. Patrick	1,800	20,000	12	170,000	July 18.
IDAHO MINES.					
Golden Chariot	1,820	90,000	17	667,500	July 11.
South Chariot	660	50,000	18	390,000	August 29.
ELY DISTRICT.					
Alps	800	30,000	9	120,000	August 8.
Meadow Valley		60,000	13	420,000	Sept. 29.
Newark	800	32,000	13	296,600	July 26.
MISCELLANEOUS.					
Belmont		50,000	9	375,000	Sept. 18.
Coso Consolidated	4,500	100,000	2	45,000	August 30.
Comanche		50,000	..		
El Dorada S. Con.	2,600	40,000	10	517,500	August 2.
General Thomas	2,100	50,000	2	50,000	July 29.
Gila		100,000	1	25,000	July 10.
Geddes&Bertrand			1		July 24.
Manhattan		50,000	..		
South Barcelona	1,500	60,000	1	60,000	August 21.

MISCELLANEOUS.

Name of Company.	Amt. per share.	Delinquent.
National Prospecting Co	10	October 16th.
Jan José	30	" 21st.
Moore's Flat Blue Gravel	25	" 18th.
Morgan (Cal.)	81	" 23d.
Golden Crown	5	" 20th.
Green	$1 50	Sept. 19th.
Barcelona Consolidated	1 00	" 25th.
South Barcelona	1 00	" 27th.
Renton Coal Mining Company	1 00	July 20th.
Prospect	50	October 3 st.
North Carson (Ormsby County)	10	Nov. 16th
Virginia City Coal	10	October 17th.
San Francisco Sulphur Company	10	
Cariboo Hydraulic	15	" 30th.
Emigrant	1 00	October 23d.
Tide Land Reclamation Company	5 00	July 3d.
		Levied.
Mitchell	10	Sept. 7th.
West Comstock	25	" 12th.
Cabinet	2	" 21st.
Aureolia	10	" 23d.
Table Mountain Alpha	10	August 15th.
Low Range Ledge	2	Sept. 11th.
Roman Capitol	1 50	August 18t.
Monroe Consolidated	1¼	August 9th.
Gold Cañon Consolidated	10	Sept. 15th.
Alabama	10	August 14th.
El Dorado Deep Water and Gravel	1 00	" 22d.
Occidental Reduction Works	50	" 24th.
Great Eastern Quicksilver	20	" 21st.
Washington Blue Gravel	10 00	" 24th.
New York Hill (Grass Valley)	10	Sept. 4th.
McClellan Consolidated	10	August 21st.
Occidental Consolidated	10	" "
Solid Silver	25	July 7th.
Coquille Black Sand	30	August 8th.
Omega	5	July 31st.
Eclipse	25	" 2d.
North Dayton	10	" 31st.

Gas Stocks.

NEW YORK, FRIDAY EVENING, Oct. 20, 1876.

The market for gas stocks shows no improvement, and the general tendency is still lower prices, though we slightly change a few of our quotations to higher figures.

Auburn, N. Y., Gas Company.—This company will reduce the price of gas on the 1st of December from $3.50 to $3, net per 1,000 feet with a discount of 5 per cent. for prompt payment.

The Cincinnati Gas Company has offered to reduce the price of gas from $2.25 to $2, with 5 per cent. discount.

Perfect Combustion by an Oxygen Blast.

By this process, oxygen is imparted to the blast on BLAST FURNACES, CUPOLAS, FORGES, BOILERS, etc., simply by its passage, on its way to the place of combustion, through a chamber or vessel, holding an oxygen compound, from which, by the agitation of the air thereon, oxygen is set free and carried off with the blast. The perfection in the combustion becomes apparent from the great increase in, and concentrated state of the heat—absence of smoke and all gases, mainly of sulphurous and carbonic oxide—total conversion of all carbon in the fuel into heat, and consequent saving in fuel. The advantages from the Oxygen Blast, besides this latter, are various, such as: ON FORGE FIRES, a gain in time and perfection in welding. ON FIRES UNDER BOILERS, where the saving in fuel is from 25 per cent upwards, an increase in capacity of generating steam in the same ratio. ON CUPOLAS, an improvement in the quality of the castings, which become very tough and uniformly soft to work, the iron, while in a fused state, is purified from sulphur, carbon, etc., and, consequently, softened and strengthened.

FOR BLAST FURNACES this process is destined to overcome the shortcomings of the present system, which are all traceable to imperfection of combustion from deficiency in oxygen in the blast, and to the applied modes of furnishing this as contained in the atmosphere, together with nitrogen, necessitating the introduction of this latter in large volumes. With nothing but heat and fixed carbonic acid gas as products of combustion, and a much lessened introduction of nitrogen, conditions are created, which will not fail to bring about a radical change for the better, as regards cheapening and perfecting the product.

The work attributed to PUDDLING FURNACES and BESSEMER CONVERTERS, and that of decarbonizing the iron for wrought iron and steel purposes generally, is much shortened, simplified, cheapened and perfected, as to purity of product obtained, through the agency of the chemical oxygen in the blast.

FOR DESULPHURIZING SILVER AND OTHER ORES, the process offers the readiest and cheapest means. The process is simple and easily applied, with the only and small expense for the chamber holding the oxygen compound. The cost of the oxygen is small compared to the gain from its use, and is made subject to this. Although the process has been in use for a year, the inventor felt reluctant to offer it to the public before having demonstrated its utility and practicability, and fully established this, not from a theoretical standpoint, but from the testimony of manufacturers whose standing is of the highest order, and such as to entitle it to the consideration of others. For further particulars address CHAS. HORNBOSTEL,

56 Broadway (Room 26), N. Y.

Having used the oxygenated blast, the invention of Mr. HORNBOSTEL, for over a year, we can give it our full endorsement as a matter of merit. The oxygen in the blast operates towards increasing and purifying the heat to such an extent as to make it of more and better service, and becomes a fuel and time-saving medium.

HERRING & CO., SAFE MANUFACTURERS,
251 & 253 Broadway, N. Y.

NEW YORK, July 28th, 1876.

We consider the oxygenated blast of Mr. C. HORNBOSTEL, which has now been in use in our factory for nearly a year, a matter of great utility, and are quite ready to recommend the same as such. By its destroying the sulphur and otherwise purifying the fire, a quicker and better welding is had; we save time and fuel by it.

J. B. BREWSTER & CO., CARRIAGE BUILDERS,
Twenty-Fifth Street.

NEW YORK, July 26th, 1876

Montreal Gas Company.—We note recent transactions of 125 shares of this company at from $162 to $163 per share.

Germantown, Pa., Gas Company.—We note a recent auction sale of 15 shares of the stock of this company par $50@$55 per share.

Boston Gas Company.—We note a recent transaction in the stock of this company at $800 per share. This is equal to 160 per cent.

Hazleton, Pa., Gas Supply.—About $2,200 is the amount paid by the city to the gas company for its yearly supply of gas.

Chicago and New York Gas Prices.—The *Daily Bulletin* of to-day says: "People have been inquiring how it is that Chicago gas companies furnish their customers with light at the rate of $1.50 per 1,000 feet, while New Yorkers are obliged to pay $2.50."

The following list of Companies in New York and vicinity are corrected weekly by GEORGE H PRENTISS, Broker and Dealer in Gas Stocks, No. 30 Broad st., N. Y.

Companies in New York and Vicinity	Cap. Stk.	Par.	last Divid.	When Paid.	Bid.	Askd.
			pr.c			
Mutual, N. Y.	$5,000,000	$ 100	2¾	Jan. '76	108½	110
" " Bonds	90,000	1,000	†3½	Feb. '76	106	110
NewYork, "	4,000,000		5	Jan. '76	139	143
Metropol. "	2,500,000	100	5	Mar. '76	145	145½
" " Certf.	1,000,000	....	3½	" "	102	104½
" " Bonds	500,000	1,000	3½	Jan. "	102	102½
Harlem "	1,850,000	50	4	Feb. '76	102	105
Manhattan "	4,000,000	50	10	July "	245	250
Brooklyn, B'klyn.	2,000,000	25	5	June '76	180	190
Nassau "	1,000,000	25	4	Jan. '76	75	—
" " Certf.	700,000	1,000	3½	Nov. '76	95	—
People's "	1,000,000	10	3½	Jan. '76	—	50
" " Certf.	300,000	1,000	3½	Jan. '76	85	90
" " Bds	325,000	....	3½	Feb. "		95
Metropol. "	1,000,000	10	3½	Nov. '75	—	77½
Wmsburgh "	1,000,000	50	5	Jan. '76	130	—
" " Certf.	1,000,000	....	3½	Jan. "	101	102½
Citizen's "	1,200,000	20	2½	Jan. '76	92½	95
" " Certf.	320,000	1,000	3½	April "	98	100
J. C. N.J.	386,000	20	5	July, '75	100	—
Centl. Westch. N.Y.	466,000	50	4	July, "	95	—
Subur'n " "	390,000	50				95

† Gold.

COMPANIES OUT OF TOWN.

We refer to our issue of the 7th inst. for the list of these.

TO CAPITALISTS.

6,000 ACRES MINERAL LAND.

Situate in Mercer and Venango Counties, Pennsylvania, two miles from the Jamestown and Franklin Railroad, and on the line of the Erie Southern Railroad, which will, when completed, run for several miles through the tract. The Minerals, so far as developed, consist of as follows:

COAL—Three veins underlying the whole tract.
ROOFING SLATE—Some 400 acres.
PAINT CLAY—Two veins, one red and one yellow.
GLAZING CLAY—About 15 acres of superior quality.
FIRE CLAY and RED BRICK CLAY in almost inexhaustible quantities.
IRON ORE and LIMESTONE in abundance.
OIL—Recent developments gives the assurance that a large portion of the tract is superior oil territory.

Almost the entire surface of the tract is dotted over with farms, with all the farm buildings and improvements. These farms can be sold—reserving the minerals and the usual mining privileges—for one-half the price asked for the whole. The whole tract is offered at a very low price compared to what it will bring a year or two hence. It is, undoubtedly, one of the most promising openings for capital now in the market, and should command the immediate attention of those seeking a profitable investment. Samples of all the minerals, and plot of the land, can be seen at my office, or will be sent by express, to any one meaning business. Apply to, or address,

JOS. PHILLIPS, 93 NASSAU ST., Room 2, Second Floor, N. Y.

N.B.—Special attention given to the sale of large bodies of land, agricultural, timber, and mineral.

FIRE BRICK.

B. KREISCHER AND SON.

58 Goerck street,

Corner Delancey street, East River. NEW YORK.

Blocks, Slabs, and Clay Retorts.

Branch Works at Kreischerville, Staten Island.

ESTABLISHED 1845.

137th Auction Sale.

100,000 TONS SCRANTON COAL,

ON

WEDNESDAY, Oct. 25th, 1876.

NEW YORK, Oct. 16th, 1876.

THE DELAWARE, LACKAWANNA AND WESTERN RAILROAD COMPANY will Sell, by Messrs. JOHN DRAPER & CO., Auctioneers, at the Company's Sales Room, 26 Exchange Place, corner of William Street, New York, on Wednesday, Oct. 25th, 1876, at Twelve O'clock, Noon,

100,000 TONS OF COAL,

from the Lackawanna Regions, of the usual sizes, deliverable at the option of the Company, at their Coal Docks at Hoboken, during the month of November, 1876.

The Sale will be positive; each lot put up will be sold to the highest bidder.

No Bids, in any form whatever, being made for account of, or on behalf of the Company.

The conditions will be fully made known at the time of sale.

TERMS—FIFTY CENTS PER TON, payable in current funds, on the day of Sale, and the balance within ten days thereafter, at the Office of the Company.

SAMUEL SLOAN, President.

Office Delaware & Hudson Canal Co.,

COAL AND IRON EXCHANGE,

Corner Cortlandt and Church Streets,

NEW YORK, Oct. 18, 1876.

The Delaware and Hudson Canal Company, will Sell

At Public Auction,

By Messrs. JOHN H. DRAPER & CO. Auctioneers,

AT THE COAL AND IRON EXCHANGE,

Corner Cortlandt and Church Streets,

On THURSDAY, the 26th day of October, inst.,

At Twelve O'clock Noon,

100,000 Tons Lackawanna Coal,

of the usual sizes, deliverable at Company's Coal Docks at Rondout, during the month of November, 1876; those who wish the Coal brought to New York Harbor, the Company will tow the vessel up and down for at its own expense.

THOMAS DICKSON, President.

WILL SHORTLY APPEAR,

ROTHWELL'S STATISTICS OF COAL.

By RICHARD P. ROTHWELL, Mining Engineer,

EDITOR OF THE ENGINEERING AND MINING JOURNAL.

A BOOK INVALUABLE TO EVERY COAL MINER, MERCHANT, OR CONSUMER.

The only Statistics which give the Actual present Production of Coal in the United States.

The most valuable epitome of information connected with the Production, Transportation, Cost, and Economic Value of Coal that has ever been compiled.

The following are a few of the heads under which the fullest and most accurate information relating to the subject has been summarized:

UNITED STATES.—The Area of our Coal Fields.
The Number and Thickness of the Coal Beds.
The Analysis and Economic Value of the Coal.
The Production of Coal in each State since its Mines were first opened.
The Cost of Coal at the Mines and in the principal Markets during the Century.
The Consumption of Coal in different Industries and Markets.
The Value of Coal Lands.
The Rates of Wages paid to Miners for a number of Years.
The Cost of Mining.
The Combination Rules governing the Anthracite Coal Trade.
The Coal Tonnage of the principal Coal-carrying Roads and Canals.
The Rates of Freight charged.
The Distances from the Coal Fields to the principal Markets.
Imports and Exports of Coal.

FOREIGN COAL.—The Coal Area, Number and Thickness of Coal Beds of all Foreign Countries.
The Amount of Coal mined from the earliest Times in all Coal-producing Countries.
The Analysis and Economic Value of Foreign Coals.
The Coal Production and Consumption, Imports and Exports of Foreign Countries.
The Coal Trade of the World.

Memoranda giving an immense amount of Practical Information, relating to Coal Mining, Mechanical Preparation of Coal, Transportation by Land and Water, the Storage and the Combustion of Coal, &c., &c.

Published by the Scientific Publishing Co., 27 Park Place, New York.

E. P. BAUGH'S PATENT SECTIONAL MILLS,

FOR CRUSHING, GRINDING, AND PULVERIZING

Gold and Silver Quartz, Raw Bones, Phosphate Rock, Plaster, Dye Woods, Minerals, Shells, and all other hard and tough substances.

Patented in the United States, Great Britain, France, and Belgium.

MANUFACTURED BY

BAUGH & SONS,

20 South Delaware Avenue, Philadelphia.

☞ Five sizes of these Mills can be seen in operation in Machinery Hall, Sec. A, 8, Col. 61 and 62.

NIAGARA STEAM-PUMP WORKS.

MANUFACTORY, 23 ADAMS ST., BROOKLYN, N. Y.

ESTABLISHED 1862.

THESE PUMPS HAVE TAKEN

FIRST PREMIUMS

On Practical Tests at Various

EXHIBITIONS.

PATENTED IN THE UNITED STATES, ENGLAND, FRANCE AND BELGIUM.

CHARLES B. HARDICK, Manufacturer,

No. 23 Adams Street, Brooklyn, N. Y.

Depot in North-West: 38 and 40 S. Canal street, Chicago, Ill.

KLEIN, LOGAN & CO.,

PITTSBURG, PA.,

MANUFACTURERS OF EVERY DESCRIPTION OF

MINING & QUARRY PICKS.

SEND FOR CIRCULARS.

THE COLLIERY GUARDIAN,

AND

Journal of the Coal and Iron Trades.

A General Commercial Newspaper,

Published Weekly, in time for Friday Evening's Mail. Price, 5d.; Stamped, 6d.; Per Annum, 21s.; Stamped, 26s.

This Newspaper was established in the year 1860, for the specific purpose of representing the Coal and Iron Trades of Great Britain, and of promoting the interests of the gentlemen engaged therein.

It is the property of a large and influential company of Colliery Proprietors and Ironmasters, who represent many of the largest and most important coal and ironworks in the Kingdom.

It is the recognized Organ of the Coal and Iron Trades, having the cordial approval and sanction of the Mining Association of Great Britain, the North of England Institute of Mining Engineers, the South Lancashire and Cheshire Coal Association, the Midland Institute of Mining Engineers, the South Staffordshire and East Worcestershire Institute of Mining Engineers, the Coal and Ironmasters' Association of Scotland, etc., etc.

Its subscribers comprise nearly all the proprietors, managers, and agents of collieries and ironworks in the United Kingdom, and include also a very large proportion of the upper class of officials entrusted with the management of the various departments of coal mining and iron making. It also circulates largely amongst gentlemen engaged in scientific pursuits and in the various branches of manufacture and commerce.

OFFICES:

5 BOUVERIE STREET, FLEET STREET, LONDON.

W. M. HUTCHINGS, Publisher.

VALUABLE GERMAN BOOKS

AT

LESS THAN HALF PRICE.

The following, and a large number of other Second-hand German Books, will be sold

AT ABOUT ONE-THIRD REGULAR PRICES.

Allgem, Familienzeitung, 1873, 1874. 2 vols., folio. Cloth bd.	5 00
Petermann's Geogr. Mittheilungen, 1870, 1871. Unbound.	6 00
Wieland's. Werke, Heransg. v. H. Kurz. 3 vols. Unbound.	1 75
Scherr. Allg. Geschichte d. Literatur. 2 vols., 1869. Unbound.	2 25
Berichte, Stenographische der Verhandlungen der deutschen constitut. National Versammlung in Frankfurt 1848-49. 9vols., 4to. Bound in boards.	13 00
Laube, der deutsche Krieg, Histor. Roman. 3 aufl., 9 vols. Unbound.	2 25

Address:

STECHERT & WOLFF,

No. 2 BOND STREET,

NEW YORK.

NATIONAL TUBE WORKS CO.

PATENT

Indestructible Enameled Wrought Iron.

LAP-WELDED PIPE,

From one-half inch to fifteen inches diameter.

Now extensively used for

Water, Gas, Sewerage, and Mining.

It is not affected by heat or cold, acids, caustic, or potash in solution, boiling water, salt or fresh. Joints connected by our **Patent Sleeve Couplings,** preventing all leakage.

Malleable Iron Fittings (enameled), and **Composite Enamel** for making Joints, supplied to Plumbers, Steam and Gas Fitters, etc.

A Special Gold Medal awarded our

WATER PIPE

at San Francisco Exposition of 1875. SILVER MEDALS by Massachusetts Charitable Mechanics Association; American Institute, New York, and Cincinnati Industrial Exposition. Also, Medal from Centennial Exposition, Philadelphia.

Specimens can be seen and obtained at Office of

NATIONAL TUBE WORKS COMPANY,

8 Pemberton Square, Boston, Mass., and McKeesport, Penn.

"BLACK DIAMOND STEEL WORKS,
"PITTSBURG, October 9th, 1876.

"F. ALDEN—Dear Sir: I certify that to-day at Messrs. PARK, BRO. & Co.'s. Steel Works, on test trial of your Patent Ore Pulverizer, of 18,000 pounds, that 2,246 pounds of **Mo. Hard Iron Ore** were reduced, with great ease, at one operation to a fix, or size of fine gravel, sand, and dust, inside of nineteen minutes, or rate of 7,000 pounds per hour. Of the great efficiency of your Ore Pulverizer, there can be no question.

"JOHN HANCOCK, Manager."